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ABSTRACT

This instructor's guide contains 11 lesson plans for inplant classes on workplace skills for employees in a cement plant. The 11 units cover the following topics: goals; interpreting memoranda; applying a standard set of work procedures; qualities of a safe worker; accident prevention; insurance forms; vocabulary development; inventory control forms; job-related spelling and mathematics applications; and standard and military time. Lesson objectives, materials needed, job-related materials, pre- and posttests and a glossary also are included in the guide. (KC)

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ED 379 513

CEMENT

"a concrete experience"

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a curriculum developed for the Cement Industry

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CE 068 364

Introduction:

Teacher Notes
&
Course Goals

Project VISIONS

CEMENT Lesson Plans

developed by: Mary Lou Taylor, Instructor
at Holnam, Inc., Holly Hill
for
a National Workplace Literacy Grant
received by
Orangeburg-Calhoun Technical College
Orangeburg, SC

These lesson plans were developed for use at Holnam, Inc. a cement manufacturing plant in Holly Hill, South Carolina. When possible some of the actual company forms have been used to provide practice for participants on the actual forms. The participants range in educational level from 2 years of formal education to High School graduates and everywhere in between. The range of skills is likewise varied. Activities were developed to appeal to a wide range of skills and all are done using collaborative group techniques. The participants are encouraged to talk among themselves in the group and share ideas openly without the fear of judgment by others. This is the main principle by which the classes are run. At Holnam, the majority of employees have been with the company for more than 15 years. They have proven themselves to be capable of performing above their expected level given their educational backgrounds. They are valued and trusted workers.

CEMENT is an acronym for *C*ontinuing *E*ducation *M*eans *E*xcellence *N*ow and *T*omorrow. Participation in the CEMENT Program is voluntary and off the clock. All participants are paid by the company for their time in class.

"The contents of this curriculum were developed under a grant from the Department of Education. However, these contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the federal government."
start with it in this class.

Instructor Notes

The lessons in this curriculum were developed for use at Holnam, Inc. a cement manufacturing plant in Holly Hill, SC. These were used as part of a National Workplace Literacy Grant awarded to Orange-Calhoun Technical College for use at three sites.

The lesson plans included in this publication are representative of those used throughout the eighteen (18) month grant period. Some of the lessons are presented in one or two classes when in actuality they were introduced, practiced, and reviewed in several classes. The format should lend itself to easy adaptation.

The classes at Holnam were named CEMENT, an acronym which stands for ***C***ontinuing ***E***ducation ***M***eans ***E***xcellence ***N***ow & ***T***omorrow. Class participants ranged in educational level was from two years of formal schooling to High School graduates. There ability range was likewise scattered.

To address this varied audience, collaborative groups, whole language, and a technique called active reading were used. Active reading, also known as Reciprocal Reading, models good reading and thinking skills simultaneously (an article on this method is included in the reference section of this curriculum). If you are not familiar with the active reading technique, please take the time to read the article as this has been a most helpful tool.

You will notice that many of the lessons in this curriculum are presented to the participants in the form of a memo. The memo format is used to allow participants to become familiar with the format and provide a class-related reading exercise, thus allowing the participants to become comfortable with both reading and receiving memos in order that they will be able to generate their own memo in response to a directed question in later lessons.

The role of the instructor in these lessons is more akin to that of a facilitator. Participants are encouraged to talk among themselves and ask questions of each other to collectively solve the situation they are assigned. They are allowed to call on the instructor when there is a problem reaching group consensus. The interaction provided in these activities serves as a

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basis for the introduction of the "team" concept that is being studied by the company as they are preparing for changes and modernization.

When the classes with math skills are conducted, the instructor may have to leave the role of facilitator and enter the instructor's role. This will depend on the level of your group, often is was necessary to conduct these classes through a guided practice approach. Time is spent thoroughly discussing the aspects of each problems and the solutions are worked on the board while participants work them on paper.

Separate pre and post tests are included with these plans and are found in the addendum labeled "Pre-Test and Post Test." These tests are competency-based and teacher developed for use with this specific curriculum.

Good luck in using these activities, I hope that you will find them helpful in your setting.

I wish to thank the various employees of the Holnam Plant in Holly Hill, South Carolina for their gracious help and support of the program.

Course Goals and Objectives are found on the next page.

Curriculum Goals - Holnam, Inc.
CEMENT Program

GOALS:

I. To involve participants in learning activities that will increase their self-confidence and prepare them for the future.

II. To conduct class sessions using collaborative group techniques that encourage participation and enhance participants competencies in speaking, listening, reasoning and problem solving abilities on the job.

III. To conduct task analyses in order to identify the underlying skills necessary for employees to perform their job competently and to use these skills as the basis for the curriculum.

IV. To focus on the basic skills of reading , writing and math that are necessary to competently complete their jobs and to prepare them for advancement as jobs are upgraded and/or modernized.

V. To improve productivity and safe working habits through building of worker awareness of their role in the performance of these skills.

OBJECTIVES:

At the conclusion of classes, the participants will be able to:

1. State the purpose of a memo with 100% accuracy.

2. Improve their knowledge and use of work-related vocabulary with a minimum of 90 % accuracy.

3. Demonstrate an understanding of the use of formulas used in refractory math by solving problems with a minimum of 90% accuracy.

4. Demonstrate a working knowledge of the 24-hour clock system.

5. Develop an awareness of the Inventory Control Process used in the Packhouse and the related math that accompanies this system.

6. Enter data on forms correctly.

7. Complete a pre and post assessment of skills and exhibit a minimum of 10% improvement of scores.

Curriculum

for

CEMENT

Lesson # 1

LESSON OBJECTIVES:

Upon completion of this lesson the participants, working in collaborative groups, the whole group, and individually, will be able to:

1) state in their own words a brief explanation of what a goal is.
2) set at least two short term educational goals for cycle III.
3) participate in a class discussion (group brainstorm) on goal setting.

Materials:

Memo #1
Copies of course goals
paper
pencils/pens
Individualized Education Plans (IEP)

Instructor Materials:

Newsprint pad
markers
tape

MEMO #1

To: Continuing Education Foundation
From: Lou Taylor
Date: July 8, 1994
Subj: Goal Setting

What is Goal Setting?

A goal is something that we want to do or achieve. We set goals by selecting things that we want to achieve and sometimes we put a time frame with the goal. We can choose personal goals like going on a vacation, painting the house, buying a new car, having another child, or saving for our retirement. Or we can set educational goals like improving our writing, working to get our GED, going to a Technical College, graduating from college, or to generally improve our thinking and reasoning skills. At work, the plant has a production goal of 1,043,668 tons of clinker for this year(1994).

As you can tell some of these goals may take a long time to complete and some can be done in a relatively short period of time. For example, saving for your retirement may be something you start on the very first day you work and continue for thirty or more years while painting the house may be done during your next long weekend. When we set goals that will take a long time to complete, we call these long term goals. The goals that we can accomplish in a short period of time are called short term goals.

How will we use goals in this class?

In class today, we are looking at the educational goals we can set for ourselves both long term and short term. In order to set short term goals we will need to look at what will be covered in class. You will receive a pink sheet with the class goals for cycle III (these are the goals that I have set for the class). I want us to look at these one at a time and set our goals by what it will take to achieve the class goals. This way we will all be working to meet the same goals and together we will each accomplish what we want out of the class. By setting goals we know what we want and then we can work to achieve it.

ASSIGNMENT:

Pay close attention as we discuss each of the course goals. I will be making notes and putting them up around the room. When we go through all of the cycle goals, it will be time for you to select which of the goals you want to be your goals for this cycle. The counselor will assist you in getting your goals down on paper. I will assist in meeting the goals through class instruction and you will assist yourself by coming to class and working to meet the goals that you have set for yourself.

Together Everyone Achieves More !!!

Curriculum Goals - Holnam, Inc.
CEMENT Program

GOALS:

I. To involve participants in learning activities that will increase their self-confidence and prepare them for the future.

II. To conduct class sessions using collaborative group techniques that encourage participation and enhance participants competencies in speaking, listening, reasoning and problem solving abilities on the job.

III. To conduct task analyses in order to identify the underlying skills necessary for employees to perform their job competently and to use these skills as the basis for the curriculum.

IV. To focus on the basic skills of reading , writing and math that are necessary to competently complete their jobs and to prepare them for advancement as jobs are upgraded and/or modernized.

V. To improve productivity and safe working habits through building of worker awareness of their role in the performance of these skills.

OBJECTIVES:

At the conclusion of classes, the participants will be able to:

1. State the purpose of a memo with 100% accuracy.

2. Improve their knowledge and use of work-related vocabulary with a minimum of 90 % accuracy.

3. Demonstrate an understanding of the use of formulas used in refractory math by solving problems with a minimum of 90% accuracy.

4. Demonstrate a working knowledge of the 24-hour clock system.

5. Develop an awareness of the Inventory Control Process used in the Packhouse and the related math that accompanies this system.

6. Enter data on forms correctly.

7. Complete a pre and post assessment of skills and exhibit a minimum of 10% improvement of scores.

Lesson #2

LESSON OBJECTIVES:

Upon completion of this lesson, the participants, working in collaborative groups, will be able to:

1) evaluate the "Placing Material in Wetlands" memo and answer the listed questions.
2) compare the two memos about "Designated Parking ..." by answering the listed questions and
    a- speculate on the possible cause of the delay in painting the clay tanks.
    b- report out and participate in class discussion to reach a consensus on the cause of the delay.

Materials:

Memo #2
"Placing Material in Wetlands" memo
"Designated Parking Areas While #1, 2, and #3 Clay Tanks are Being Painted" memos dated 2/03/94, and 3/02/94 revisions
pencils/pens

MEMO #2

TO: CEMENT Classes
FROM: Lou Taylor
DATE: 7 February 1994
RE: Company Memos

We have discussed that memos are sent out for many reasons. In this class we will look at three company memos that have been sent out this year. Look over them and answer the following questions about each.

1) What was the purpose of this memo? (what is it telling us about)

2) Have you received a copy of this memo before? YES or NO
If you answered no, have you been told the information in the memo by your supervisor?

3) Would the information in the memo help you to perform your job better? YES or NO
   - If you answered YES, how would it help you to do a better job?

   - If you answered NO, why do you think the memo was sent?

4) What was the topic of each memo? (hint: RE:)

5) Compare the two memos from Larry Shingler and Robert West:
   → What is the original date of these memos?
   → Why were they revised?
   → What do you think is the cause of all the delays in painting the clay tanks?

HOLNAM/SANTEE INTEROFFICE MEMO

To: ALL PERSONNEL AT THE HOLLY HILL PLANT

From: WPT

Subject: PLACING MATERIAL IN WETLANDS

Date: SEPTEMBER 2, 1993

CC:

IT IS AGAINST THE REGULATION OF EPA AND THE U.S. ARMY CORP OF ENGINEERS TO FILL ANY MATERIAL IN A WETLAND.

IN FACT THEY WILL NOT EVEN LET YOU REMOVE A STUMP FROM WETLANDS BECAUSE IN THE PROCESS DIRT WILL FALL BACK IN THE HOLE WHICH IS A VIOLATION.

NO ONE, EMPLOYEE OR OTHERWISE MAY HAUL, DEPOSIT, OR MOVE DIRT IN ANY AREA OF THE PLANT OTHER THAN THE PERMITTED MINE AREA WHICH IS BOUNDED BY THE NEW HOME BRANCH DITCH ON THE WEST, NORTH AND EAST AND THE ROADS AT THE EDGE OF THE QUARRY ON THE SOUTH EAST, SOUTH AND SOUTH WEST.

IF THERE IS A NEED TO MOVE OR PLACE DIRT IN ANY OTHER PLACE ON THE PLANT SITE PERMISSION MUST BE OBTAINED FROM EITHER ROBBIE MIMS OR MYSELF.

THIS CAN BE A FEDERAL OFFENSE AND THE COMPANY CAN BE SEVERELY FINED IF THIS RULE IS NOT STRICTLY FOLLOWED.

SUPERVISORS,

PLEASE GIVE A COPY OF THIS MEMO TO EACH OF YOUR EMPLOYEES.

HOLNAM. INC.

TO: ALL EMPLOYEES

FROM: RWS, LS

DATE: 10/18/93 REVISED 02/03/94

SUBJ: DESIGNATED PARKING AREAS WHILE #1,2, AND #3 CLAY TANKS ARE BEING PAINTED

THE PARKING LOTS NEXT TO THE SLURRY BASINS AND THE KILNS WILL BE CLOSED 7:00 A.M. TO 6:00 P.M. DAILY FROM 10/27/93 THRU 3/7/94 WHILE #1,2 & 3 CLAY TANKS ARE BEING PAINTED. ALL EMPLOYEES MUST PARK THEIR VEHICLES NEXT TO THE 1,000,000 GALLON STORAGE TANK EAST OF THE SOUTH SCALE.

***REMEMBER, DURING THE PARKING RESTRICTION, EMPLOYEES SHOULD NOT DRIVE BY OR NEAR #1,2, OR 3 CLAY TANKS WHILE THEY ARE BEING PAINTED.

THANK YOU FOR YOUR COOPERATION.

ROBERT WEST LARRY SHINGLER

RWS/PARK

PLEASE NOTE THAT PARKING PERMITS REMAIN ON FILE WITH L. SHINGLER. IF YOU WANT TO PARK YOUR CAR IN THE AREA AND HAVE NOT SIGNED A PERMIT, PLEASE SEE L. SHINGLER.

NEITHER HOLNAM, INC. NOR THE PAINTING CONTRACTOR WILL BE RESPONSIBLE FOR ANY DAMAGE DONE TO YOUR VEHICLE.

HOLNAM. INC.

TO: ALL EMPLOYEES

FROM: RWS, LS

DATE: 10/18/93 REVISED 03/02/94

SUBJ: DESIGNATED PARKING AREAS WHILE #1,2, AND #3 CLAY TANKS ARE BEING PAINTED

THE PARKING LOTS NEXT TO THE SLURRY BASINS AND THE KILNS WILL BE CLOSED 7:00 A.M. TO 6:00 P.M. DAILY FROM 10/27/93 THRU 3/28/94 WHILE #1,2 & 3 CLAY TANKS ARE BEING PAINTED. ALL EMPLOYEES MUST PARK THEIR VEHICLES NEXT TO THE 1,000,000 GALLON STORAGE TANK EAST OF THE SOUTH SCALE.

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Lesson # 3

LESSON OBJECTIVES:

Upon completion of this lesson the participants will be able to apply a standard set of work procedures in work settings after first:

1) arrange a standard set of work procedures in a logical order.
2) arrange a list of procedural steps which go under each of the work procedures (they will evaluate and organize the procedures under each appropriate work step.)
3) when given a completed list of "Procedures to Follow for All Work", the participants will compare their work for accuracy.

Class Procedure

Discuss how is work done, when you do a job do you follow certain procedures every time. If you answered yes, how did you learn the procedures that you follow did someone teach you or was it by trial and error. This exercise will take the guess work out of following work procedures. We developed a list of work procedures and some substeps under each one. You will first receive the four main steps, notice that they are not in any particular order. Work in your group to decide what the order should be for these steps. Everyone in your group must agree on the final answer. Have the groups report out their results and the whole class will then discuss and decide on the order of the main steps.

Once agreement has been reached on the main steps, hand out the sub- steps and have the participants, again working in small groups, categorize the sub-steps by which main step they should fall under. Group consensus must be reached before reporting out the findings. As before, the whole class must reach consensus when compiling the small group results into a class result.

Now the instructor will distribute the Work Procedure handout with the information on it and the class will compare their results with the actual procedures. Discuss any discrepancies and also make students aware that some of these steps may fit under more than one category.

Hand out the "Procedures To Follow For All Work Checklist" and a copy of the work order. Ask the participants to use the work order to answer the questions posed on the checklist. Allow the participants to work in small groups to do this activity. Have each group elect a spokesperson to report their answers. Have the participants discuss if they think these procedures would help them to better perform their daily duties.

Class Materials:

Work Procedure Handouts
Chalk or Marker Board
chalk or markers for board
Paper/pencil for students
Procedures to follow for all Work Checklist

Work Procedures - Main Steps

Someone has gotten these four steps out of order. You need to arrange the steps in order. The steps have a blank in front of them for you to number the step.

_____ On completion:

_____ Gather the materials needed to do the job:

_____ Evaluate the job:

_____ Start the job:

Work Procedures - Sub-Steps

The steps listed below are suggestions that can go under the Work Procedures that you just put in order. Look at these steps and discuss which procedure they should go with. When you decide where they go put the number of the step in the blank beside it.

____ visual inspection of the site

____ check your work

____ do you have the materials with you

____ have supervisor sign off work order

____ use necessary safety procedures and precautions

____ assess whether or not you need help or special tools

____ return tools to their proper place

____ follow step-by-step procedures to complete the job

____ discuss with co-worker(s) type of work to be done

____ where do you go to get the tools

____ clean-up work area

Procedures to Follow for all Work
the Complete List

1. Evaluate the Job.
   - visual inspection of the site
   - discuss with co-workers type of work to be done
   - assess whether or not you need help or special tools

2. Gather the Materials Needed to do Job.
   - do you have them with you
   - where do you go to get the tools

3. Start the Job.
   - follow step-by-step procedures pertaining to the job
   - use necessary safety procedures and precautions

4. On Completion.
   - check your work
   - have supervisor sign off work order
   - return tools to proper place
   - clean-up work area

Procedures To Follow For All Work - a Checklist

1) Evaluate the Job.

⇒ Do a visual inspection of the area.
- Will any special preparation, precautions, or safety equipment be needed? YES NO If yes, please list:

⇒ Discuss with co-workers the type of work to be done.
- Have you done this type of work before? YES NO
- Is it a routine job? YES NO
  In no, what makes this job different from the ordinary?

⇒ Assess whether or not you need help or special tools to complete this job. YES NO
- If yes, list what you will need:

2) Gather Materials Needed for the Job.

⇒ Do you have the tools and materials with you? YES NO

⇒ If no, where do you go to get the tools and equipment you need?

3) Start the Job.

⇒ Use all necessary safety procedures and precautions. What are these, please list:

⇒ Follow the step-by-step procedures pertaining to the job. List the step-by-step procedures you would follow to complete this job:

4) On Completion.

⇒ Check your work.
- Is the job completed to your satisfaction? YES NO
- If no, why not?

⇒ Clean-up the work area.
- Have you cleaned up the work site? YES NO
- If no, why not?

⇒ Have your supervisor sign off the work order.
- Did you do this? YES NO
- If no, why not?

⇒ Return tools and equipment to proper place.
- Did you have to get special tools or equipment? YES NO
- If yes, where do they need to be returned to?

Lesson #4

LESSON OBJECTIVES:

Upon completion of this class, the participants will be able to:

1) Brainstorm in small groups and add at least three(3) additional items to the Qualities of a Good Worker" list.
2) Discuss the causes of accidents using a handout (A) sheet provided by the instructor and state the four areas that are most likely to cause accidents.
3) Utilize the information from the discussion and handout A to classify accidents into the four categories that were discussed.

Assignment: Distribute three (3) page handout "HAZARD RECOGNITION CHECKLIST", ask students to review this for the next class.

Materials:

Handouts:

A) Qualities of a Safe Worker
B) Causes of Accidents
C) Safety Exercise
D) Case Study
E) Hazard Recognition Checklist

Overhead transparency of Safety Exercise
Overhead Projector
Overhead Marker Pens
Paper and Pencil for Participants

QUALITIES OF A SAFE WORKER

* HAVE A CLEAR HEAD WHEN HE COMES TO WORK
* KEEP HIS MIND ON THE JOB/TASK
* CHECK MACHINE/EQUIPMENT WORKING PROPERLY
* ALWAYS MAKE SURE WORKING IN A SAFE AREA
* HAVE PROPER SAFETY EQUIPMENT (ppe)

CEMENT

SAFETY
Causes of Accidents: Points to Ponder

1) Lack of Knowledge

It is estimated that a large number of work accidents are caused by a lack of knowledge on the worker's part. The worker who has not been properly trained, misinterprets instructions, or obtains inaccurate information is the most likely to make mistakes and have accidents. A lack of knowledge can cause accidents in any job, not just where dangerous machinery of equipment is used. Workers should have the knowledge to perform a job accurately and safely before they begin to work.

2) Lack of Skills

Most jobs require that workers possess certain skills if the job is to be performed accurately and safely. In order for a worker to become skilled in a job there must be a desire to learn the skills needed, to receive proper instruction, and to practice. The lack of skills can also cause accidents in any job and the worker needs to be aware of his/her expected performance skills.

3) Poor Work Attitude

A worker's attitude towards safety on the job affects the number of accidents that occur. Having a positive attitude toward safety can help prevent accidents that occur. Every worker needs to think safety and get into the habit of doing all job tasks in a safe manner. A worker's attitude toward safety is reflected by the way he/she feels about certain safety practices and shows up in his/her behavior on the job. There are many elements which demonstrate attitudes which are directly related to worker safety and the safety of fellow workers.

4) Unsafe Environment

The environment that a person works in can affect the number of accidents that are likely to occur. Research has indicated that about 15% of all accidents can be caused by worn, dull, broken. or defective tools. More accidents occur in some jobs, such as construction, that in other areas, such as office work.

Source SC Department of Education, Safety Unit

CEMENT
Safety Exercise

Directions: Look at the following examples of accident causes and decide if they are due to:

1) lack of knowledge
2) lack of skill
3) poor work attitude
4) unsafe environment

Put the numbers 1, 2, 3, or 4 on the line in front of the cause.

___ Using equipment improperly.
___ Poor ventilation.
___ Improper lifting.
___ Defective tools or equipment.
___ Poor housekeeping.
___ Operating equipment without authority.
___ Failure to use personal protective equipment.
___ Operating equipment at improper speeds.
___ Improper loading or placement of equipment or supplies.
___ Poor illumination (lighting).
___ Inadequate warning systems.
___ Excessive noise.

Now that we've looked at causes for accidents, let's take time to see what we can do to help prevent accidents from happening in the first place.

Working with your group brainstorm a list of some of the qualities of safe workers. Use the space at the bottom of this sheet to make your list (use the back if you need more room).

HOLNAM/SANTEE CEMENT COMPANY - HOLLY HILL, SC
HAZARD RECOGNITION CHECKLIST

****

In accordance with the Mine Safety & Health Administration (MSHA), you are not authorized to enter upon Holnam/Santee property until you have read this notice and acknowledged its content by signing the appropriate sheet. Anyone entering these premises may encounter certain hazards. By law, you must be informed of their existence and how to avoid them. Read carefully and then sign the accompanying sheet.

****

1. TRAFFIC: Observe proper traffic patterns, signs, and posted speed limits.
2. MOVING MACHINERY: Be alert, keep clear, make sure operator knows your whereabouts.
3. TRIPPING OR FALLING : Exercise care when stepping over or around obstacles or when walking in work areas or on stairways. Use handrails.
4. FOREIGN OBJECTS IN THE EYE : Wear safety glasses or goggles at all times in the plant.
5. FALLING OBJECTS/OVERHEAD OBSTRUCTIONS : Wear hard hats in plant at all times.
6. FALLING OBJECTS: Wear safety shoes if performing any work. Look for incorrectly stored or stacked material.
7. INJURY FROM LIFTING: Use correct procedure and obtain help if needed.
8. DUSTY AREAS: Wear a dust mask or respirator in dusty areas. Inquire as to need.
9. NOISE: Wear ear protection in designated areas.
10. FIRE: Do not smoke or use any flame producing device in posted areas.
11. WELDING OR EXHAUST FUMES: Avoid prolonged stays in areas of strong concentration of fumes or engine exhausts.
12. WELDING & FLASH BURNS TO THE EYE: Avoid welding areas. Do not look at flash without appropriate eye wear use.
13. FIRE OR EXPLOSION OF FLAMMABLE GAS: "NO SMOKING OR OPEN FLAME" signs are posted in storage areas for compressed gas, fuels, lubricants, etc. DO NOT SMOKE OR USE ANY FLAME PRODUCING DEVICE IN THESE AREAS.
14. PRESSURE VESSELS: Use proper methods when handling gas cylinders. Secure against falling or being knocked over. Keep upright and cap when not in use. Open valves slowly; release pressure before removing caps or inspection plates. Check pressure gages and DO NOT use malfunctioning gages.
15. ELECTRICAL: Do not work on energized electrical apparatus. Shut down and lock out.
16. IMPROPER TOOL USE: Select and use proper tools, in good repair, for job.
17. GROUND CONTROL & HIGH WALLS: Do not work near unsafe ground conditions of high walls. Tow or move unit to a safe area.

18. MATERIAL STORAGE BINS, HOPPERS, OR TANKS: To work in these areas. or in high places a safety belt and lifeline, properly attached, adjusted and anchored must be worn. In all cases the "buddy" system must be used.
19. WEATHER: Avoid extreme weather conditions such as thunderstorms, rain, hail, and wind. When possible, slippery conditions must be corrected for safe footing.
20. DO NOT LEAVE DESIGNATED AREA: Unescorted trips through the plant are not allowed.
21. EQUIPMENT: Unauthorized use of Holnam/Santee equipment is prohibited.
22. FIRST AID & MEDICAL CARE: A first-aid room is located in the central part of the plant adjacent to the lunch room. Medical care is available in Holly Hill.
23. ACCIDENT OR INJURY: Immediately report any accident or injury to a member of Holnam/Santee management.
24. CONTRACTORS working on Holnam/Santee property must observe all MSHA and Holnam/Santee safety standards. Tools and equipment must be maintained in good condition with proper safety devices and operated by qualified and trained persons. By copy of this notice you accept responsibility to discuss these rules with your employees working on Holnam/Santee property.
25. EMERGENCIES: A contingency plan for emergencies is in place and personnel are trained to implement the plan if necessary. A complete copy is available in the Safety & Personnel Department for your review. Emergency evacuation procedures are established and attached for your information and implementation should the need occur.

ALWAYS EXERCISE COMMON SENSE AND GOOD JUDGMENT. YOU ARE RESPONSIBLE FOR YOUR ACTIONS AND THOSE UNDER YOUR CONTROL AT ALL TIMES WHILE ON HOLNAM/SANTEE PROPERTY.

Lesson #5

Lesson Objectives:

Upon completion of this class participants, working in small groups, will be able to:

1) When given a case study of an accident and its subsequent disciplinary action on the employee involved evaluate and state:
   A- the real cause of the accident;
   B- if they feel the actions taken against the employee were justified, too harsh, or not adequate; and
   C- how of if they would have handled the situation differently.
2) Discuss the information on the "Hazard Recognition Checklist" and be able to recognize potentially hazardous situations in the workplace.

Class Materials:

Handouts:
1) Case Study
2) Hazard Recognition Checklist - active reading activity (distributed as homework assignment in class 4)

Overhead transparencies of Hazard Recognition Checklist
Overhead Projector
Overhead Marker Pens
Paper and Pencil for Participants

CEMENT
Holnam, Holly Hill

SAFETY
Case Study - What Caused this Accident?

Judy is a laborer in the Maintenance Shop. Her regular job is to assist in cutting out patterns of sheet metal and welding. One day a truck arrived at the shop with a sheet metal delivery. The other workers had gone to lunch and no one was around to unload the metal. The truck driver was in a hurry and asked Judy if she would unload the truck. Judy did not want to look dumb and helpless so she attempted to unload the sheet metal with a forklift. She had seen other workers use the forklift, but she had never used it herself. When she tried to pick up the metal, it slipped and fell to the ground, just missing the truck driver. Judy was suspended from work for one week because of the incident.

1) Look back at the "Points to Ponder" sheet and decide what was the real cause of Judy's accident?

_____
_____
_____
_____
_____

2) Do you feel that Judy should have been suspended? If you think she should not have been suspended, then what should have happened to Judy?

_____
_____
_____
_____
_____

Source: Safety Unit, S.C. Department of Education

Lesson # 6

LESSON OBJECTIVES:

Upon completion of this lesson the participants will be able to:

1) correctly complete insurance benefit forms with proper information.
2) file the completed open enrollment insurance form with the personnel office.
3) take a CLOZE test.

Class Procedure:

One of the classes had been set aside for the topic of Insurance Jargon, ironically the time for the class coincided with the open enrollment for the company insurance. In talking with the personnel office, it was noted that an inordinate amount of time would be spent by the personnel staff reviewing the insurance forms with the employees and completing the forms for them. I was asked if I would be able to help out, so I developed some activities using the forms and worked with the participants to actually complete their forms in class. This turned out to be very rewarding to the participants who felt great about being able to turn in their forms without asking for help for the first time.

Participants will bring their Open Enrollment Packets to class, first actively read the memo from Bonnie Connelly. Ask them what kind of information do they expect to find in this memo. Go through the memo one paragraph at a time asking questions to the class as you go. Explain any vocabulary words that they may be unsure of. Encourage the participants to ask questions of you as you read.

Next, we'll look over the three page memo from Linda Strouse. Scan over the memo taking note of the headings. Which headings apply to you or contain information that you may be interested in? Look at the chart on page 2, what information does it contain? Look at the box on page 3, which forms does it tell you to return?

Look at the pink sheet, it has 1994 Benefit Election Form Instructions at the top. This will guide us through the completion of the benefits election form, find it in your packet and let's complete it. First, is the information at the top correct? If not, change it. Now, go through the numbered sections (1-5) one at a time completing only those you want to participate in. If you want to take part in the spending accounts, complete the information for numbers 3 and 4. If you want to take out the voluntary personal accident plan, complete the information on this sheet at number 5, you must also fill out a separate enrollment form for this policy which is in the Personnel Office. Add together the amounts from all the plans and enter your total where it says "sum". Now sign and date this form.

Go back to the pink sheet, the bottom half has the Instructions for completing the Employee Information Form (sheet). Now let's find the 1994 Employee Information Form, is the information on this form correct? Is your name, address, and other information on the top of the form correct, check it carefully? Are the names social

security numbers, coverage, birth date, sex and relationship of your dependents correct? Do you need to add someone to this form or take someone off of the form? Is the information under full-time student, handicap, and Medicare columns correct? Does you spouse have other insurance, check yes or no? If yes provide the name of the insurance carrier and the policy number. The last thing you do, when all the information is correct, is to sign and date the form.

Ask the participants to leave out their insurance enrollment forms so that while they are doing the next activity you can check over the forms .

Distribute a CLOZE exercise to the participants and take a few minutes to explain the procedure. Provide them with a list of the missing words. Allow about one hour for this activity, DO NOT TELL THEM THIS IS A READING TEST!!!!! That will "freak out" some of the participants. Better yet, tell them this is a test to show how well they can solve abstract problems when given clues to work with and will be used by you, the instructor, to help in the development of materials to use in class. Above all put the participants at as much ease as possible, do not make a big deal out of this exercise. Tell the participants that a score of 50% is considered good on this type of exercise. Don't let them feel that this is an impossible task!

Class Materials:

Insurance Benefits Form
1994 Benefit Election Packet (each employee had one of these mailed to their home address)
Linda Strouse Memo
Bonnie Connelly Memo
CLOZE Test

OCTOBER 21, 1993

HOLNAM - INTERNAL MEMORANDUM

TO: ALL EMPLOYEES

FROM: BONNIE CONNELLY

RE: 1994 OPEN ENROLLMENT INFORMATION - EMPLOYEE BENEFIT PLANS

THE ENCLOSED PAPERWORK COVERS INFORMATION REGARDING YOUR 1994 BENEFIT PLANS, AND **MUST BE COMPLETED AND RETURNED BY NOVEMBER 5, 1993.** IF WE DO NOT RECEIVE YOUR COMPLETED FORMS BY THE DEADLINE, YOU WILL AUTOMATICALLY RECEIVE **"EMPLOYEE ONLY"** MEDICAL AND DENTAL COVERAGE AND THE OTHER BASIC BENEFITS PROVIDED BY HOLNAM. IF YOU NEED HELP COMPLETING THE FORMS OR WANT TO COMPARE WITH LAST YEAR'S INFORMATION, PLEASE CONTACT SANDRA GRIFFIN OR ME.

IN ADDITION TO THE OTHER INSURANCE BENEFITS PREVIOUSLY OFFERED, IN 1994 THE COMPANY IS MAKING **VOLUNTARY PERSONAL ACCIDENT INSURANCE COVERAGE** AVAILABLE TO YOU. A BROCHURE OUTLINING THE COVERAGE AND PREMIUM COST IS ENCLOSED WITH YOUR PACKET. THE PREMIUM IS DEDUCTED EACH PAY PERIOD ON A "BEFORE TAX" BASIS. IF YOU ARE INTERESTED IN PURCHASING THIS COVERAGE, PLEASE PICK UP AN APPLICATION FROM THE PERSONNEL DEPARTMENT.

PLEASE DO NOT WAIT UNTIL THE LAST MINUTE TO COME BY THE PERSONNEL OFFICE IF YOU NEED HELP COMPLETING YOUR PAPERWORK. THE LONGER YOU WAIT, THE LONGER THE LINE GETS!

REMEMBER, THE PAPERWORK MUST BE COMPLETED BY EVERYONE, EVEN IF NO CHANGES ARE MADE FROM LAST YEAR.

NOTE TO SALARIED EMPLOYEES: THE PERSONAL ACCIDENT INSURANCE HAS BEEN OFFERED TO YOU FOR SEVERAL YEARS. IF YOU DO NOT HAVE IT AND WISH TO ENROLL, GET YOUR APPLICATION FROM PERSONNEL.

1994 BENEFIT ELECTION FORM INSTRUCTIONS

Verify name, location, date of birth, hire date, and employee number.

#1 - Choose the medical coverage that best fits your needs.

#2 - Choose the dental coverage that best fits your needs.

#3 - If you want to enroll in the health care spending account, fill in the amount you want withheld from your semi-monthly/weekly pay.*

#4 - If you have eligible dependents for child day care or elderly dependent care and want to enroll in the dependent care spending account, fill in the amount you want withheld from your semi-monthly/weekly pay.*

#5 - Choose the Voluntary Personal Accident Insurance if you want to enroll in it. Be sure to choose the correct coverage (single/family) and the dollar amount of coverage. Fill in the semi-monthly premium, which you can find included in the interoffice memo enclosed. This will be deducted from your semi-monthly pay.

Total #1, #2, #3, #4, #5 - This is the total amount that will be withheld from your semi-monthly/weekly pay.

*If you need more information, please refer to your Benefit Handbook, contact your location manager or the Corporate Human Resources office.

**If you need an application or brochure, please contact your location manager or the Corporate Human Resources office.

INSTRUCTIONS FOR COMPLETING THE EMPLOYEE INFO SHEET

Verify that all information is correct. Be sure your address, employee number, marital status, and work location is correct.

Verify Social Security numbers, dates of birth, student status, handicap status, and Medicare status on yourself and your dependents.

Choose, with a check mark, what coverage you want for yourself and your eligible dependents: HMO, MED (medical), DENT (dental).

Be sure to sign your name at the bottom of the form and fill in the date.

Return it to Corporate Human Resources along with your 1994 Benefit Election Form.

PLEASE REMEMBER: THE COVERAGE YOU SELECT IS THE COVERAGE YOU KEEP UNLESS YOU HAVE A FAMILY STATUS CHANGE DURING THE YEAR. CONTACT YOUR LOCATION MANAGER OR THE CORPORATE HUMAN RESOURCES OFFICE WITHIN 30 DAYS OF THE CHANGE SO YOU WILL BE ABLE TO MAKE THE NECESSARY CHANGES. IF YOU DO NOT NOTIFY US WITHIN 30 DAYS, YOU WILL NOT BE ALLOWED TO MAKE THE CHANGE.

wp:\hrinv\94.ins

BEST COPY AVAILABLE

COMPANYS COPY

1994 BENEFITS ELECTION FORM
ACTIVE NON-UNION HOURLY EMPLOYEE

NAME: BIRTH DATE: / / HIRE DATE: / /
LOCATION: EMPLOYEE NO:

PLEASE SELECT YOUR BENEFIT COVERAGE FOR 1994 AND WRITE THE COST OF EACH OPTION YOU CHOOSE ON THE APPROPRIATE LINE. SIGN THE FORM AT THE BOTTOM AND RETURN THE ORIGINAL TO THE CORPORATE HUMAN RESOURCES DEPARTMENT IN DUNDEE, MI FOR PROCESSING. ALL RATES SHOULD BE ENTERED AS WEEKLY AMOUNTS.

1. HOLNAM MEDICAL 80%/20% COVERAGE FOR: WEEKLY

01___ME ONLY $ .00
02___ME & ONE DEPENDENT $ 5.77
03___ME & MY FAMILY $ 11.54

SPENDING ACCOUNTS: WEEKLY

3. HEALTH CARE ACCOUNT.

ENTER WEEKLY AMOUNT,
UP TO $ 60.00 $_____

4. DEPENDENT CARE ACCOUNT.

ENTER WEEKLY AMOUNT,
UP TO $ 48.00 FOR EACH DEPENDENT
BUT NO MORE THAN $ 96.00 $_____

5. VOLUNTARY PERSONAL ACCIDENT:

01___SINGLE
COVG: _____ COST: $_____
02___FAMILY
COVG: _____ COST: $_____

COMPANY PAID COVERAGE FOR

BASIC AD&D INSURANCE
BASIC LIFE INSURANCE
SICKNESS & ACCIDENT

2. DENTAL PLAN COVERAGE FOR:

01___ME ONLY $ .00
02___ME & ONE DEPENDENT $ .00
03___ME & MY FAMILY $ .00

TOTAL WEEKLY COST OF YOUR ELECTIONS (SUM 1 + 2 + 3 + 4 + 5) $_____

I HAVE INDICATED MY 1994 BENEFIT ELECTIONS ABOVE. I UNDERSTAND I CANNOT CHANGE MY ELECTIONS BEFORE 1995 UNLESS MY FAMILY STATUS CHANGES. I AUTHORIZE HOLNAM TO WITHHOLD THE DEDUCTION AMOUNTS ON A BEFORE TAX BASIS FROM MY 1994 WEEKLY PAY.

DATE _____ SIGNATURE _____ HOURLY

10/19/93 G/W DIVN: 004

Please review the coverage and cost of the Medical Plan, as well as that of the other Plans outlined on the Election form, before making your final selection. Review the enclosed instruction page for more details on completing your Benefit Election and Employee Information forms. Remember that your selections will be in effect for all of 1994 unless you experience a qualified change in family status.

NOTE: If we do not receive your completed 1994 Open Enrollment forms by November 8, 1993, you will automatically receive "employee only" medical and dental coverage and the other basic benefits provided by Holnam.

You must return:

- **the Company copy of the Benefits Election form (keep the employee copy for your records)**
- **the Employee Information form**
- the application form for Personal Accidental Death and Dismemberment coverage only if you are changing coverage levels or are enrolling in the plan for the first time. (form can be obtained from your personnel or facility manager)

If you have any questions regarding 1994 benefit elections, your personnel or facility manager can help you get the answers or call Linda Strouse, Vicki Viers or Debbie Murphy in the Corporate Human Resources department in Dundee, Michigan at 1-800-831-9507.

Again, carefully review the enclosed materials, complete and return the appropriate forms to your local manager, if so directed, or to the Corporate Human Resources department in Dundee, MI.

DUE DATE IS NOVEMBER 8, 1993

Intercompany Correspondence

TO: All U.S. Holnam Salaried and Non-Union Hourly Employees

FROM: Linda Strouse
Benefits Administrator

DATE: October 15, 1993

SUBJECT: Open Enrollment Information for the 1994 Benefit Plan Year

At this time each year, we request that you enroll in benefit plans for the coming year. The following information provides a brief overview of the various plans provided to you. Please refer to your Benefits Handbook for more complete information regarding Holnam's benefit plans.

MEDICAL & DENTAL PLANS

As in the past, Holnam will offer alternative choices for medical plan coverage to those employees who reside in areas where Holnam offers an HMO option. You may elect to have medical coverage provided by either the Company's indemnity plan (Great West Life) at the 80/20 co-insurance level, or through an HMO where HMO's are available. Specific information and enrollment forms for HMO's offered in your area may be obtained from your facility manager. The employee share of the 1994 semi-monthly medical cost for Holnam's Medical Plan and for the HMO (if available) are printed on the enclosed 1994 Benefits Election form.

SPENDING ACCOUNTS

Health care and dependent care spending accounts will again be offered for the 1994 Plan Year. The spending accounts allow you to have pre-tax deductions taken each pay to help you pay for eligible health care and dependent care expenses.

The Corporate Human Resources department in Dundee, Michigan will administer the Spending Accounts. The minimum amount for which a reimbursement check will be issued is $25.00. Blank Spending Account Reimbursement forms are available from your personnel or facility manager.

The use of the Spending Accounts requires careful planning on your part, but it can prove to be a valuable tax savings feature for you.

PERSONAL ACCIDENT INSURANCE PLAN

The Personal Accident Insurance Plan provides accidental death and dismemberment protection for you and your family. Coverage is available in a benefit amount which you select. The Personal Accident Insurance Plan is new for this year at the non-union hourly facilities.

If you are not presently enrolled and wish to obtain coverage for 1994 or if you wish to change the amount of your coverage, you must complete the Voluntary Personal Accident section on the Benefits Election form and <u>also submit a separate application form</u>. A brochure explaining the plan and an application form are available from your personnel or facility manager.

For your convenience, the cost of coverage under this voluntary plan is outlined below:

BENEFIT AMOUNT	WEEKLY COST		SEMI-MONTHLY COST	
	EMPLOYEE ONLY	FAMILY PLAN	EMPLOYEE ONLY	FAMILY PLAN
$ 10,000	$ .09	$ .14	$ .20	$ .30
20,000	.18	.28	.40	.60
30,000	.28	.42	.60	.90
40,000	.37	.55	.80	1.20
50,000	.46	.69	1.00	1.50
60,000	.55	.83	1.20	1.80
70,000	.65	.97	1.40	2.10
80,000	.74	1.11	1.60	2.40
90,000	.83	1.25	1.80	2.70
100,000	.92	1.38	2.00	3.00
125,000	1.15	1.73	2.50	3.75
150,000	1.38	2.08	3.00	4.50
175,000	1.62	2.42	3.50	5.25
200,000	1.85	2.77	4.00	6.00
225,000	2.08	3.12	4.50	6.75
250,000	2.31	3.46	5.00	7.50
300,000	2.77	4.15	6.00	9.00

NOTE: Coverage cannot exceed 10 times your annual salary.

SUMMARY

The choice of benefit plan participation is very important for you and your family. **Your decision is for the full calendar year 1994, so make sure the choice is right for you.** Remember that all of the above deductions are taken on a pre-tax basis from your regular paycheck. As a result, we must comply with certain government regulations which do not allow you to change your election during the year, unless you show proof that your family status has changed. If you incur a change in family status, a status change form and applicable enrollment forms must be completed and received by the Corporate Human Resources department **WITHIN 30 DAYS** of the family status change. **IF YOU FAIL TO MEET THIS REQUIREMENT, YOU WILL NOT BE ALLOWED TO MAKE A CHANGE IN YOUR COVERAGE ELECTION UNTIL THE NEXT OPEN ENROLLMENT PERIOD.** A change in family status is considered to be:

a. your marriage
b. your divorce
C. birth or adoption of a child
d. death in your immediate family
e. spouse's commencement or termination of employment
f. either spouse or employee changing from part-time to full-time employment status or vice versa
g. either employee or spouse taking an unpaid leave
h. significant change in health coverage of spouse attributable to the spouse's employment.

NAME: EMPLOYEE NO.:

1994 EMPLOYEE INFORMATION FORM

LOCATION: SALARIED: HOURLY: DATE OF HIRE:

ADDRESS: MARITAL STATUS: TELEPHONE:

BIRTHDATE:

SEX:

```
**************************************************
* 01 - SINGLE     02 - MARRIED     03 - DIVORCED *
* 04 - WIDOW(ER)  05 - SEPARATED                 *
**************************************************
```

SPOUSE AND DEPENDENT INFORMATION

PLEASE VERIFY PRINTED INFORMATION, CORRECT ANY ERRORS AND FILL IN MISSING INFORMATION. INDICATE DESIRED COVERAGES BY MARKING AN X IN THE APPROPRIATE COLUMNS FOR SPOUSE AND EACH DEPENDENT.

NAME	SSNO	COVERAGE HMO	COVERAGE MED	COVERAGE DENT	BIRTHDATE	SEX	RELATIONSHIP	FULLTIME STUDENT (YES/NO)	HANDICAP (YES/NO)	MEDICARE (YES/NO)
		___	___	___			SELF			
		___	___	___						
		___	___	___						
		___	___	___						
		___	___	___						
		___	___	___						

SPOUSE/DEPENDENTS HAVE OTHER INSURANCE COVERAGE ___ YES ___ NO NAME OF CARRIER: _____

POLICY NUMBER: _____

EMPLOYEE SIGNATURE: _____ DATE: _____

RETURN COMPLETED FORM TO: HOLNAM, HUMAN RESOURCES DEPARTMENT
6211 NORTH ANN ARBOR ROAD
PO BOX 122
DUNDEE, MI 48131

CEMENT
Cloze Exercise

Directions: Use the word list to help you fill in the blanks in the following exercise. You may recognize this as a passage from the Holnam brochure (the gray book).

demand	increased	after	produced
rotary	furnaces	business	able
and	of	they	went
plant	easy	Company	for
began	supply	paralleled	belt
developed	phase	tons	

The story of the Holnam Holly Hill cement plant begins with the vision and desire of its founders to be a part of the growth in this region. The plant's founders, Mr. W. J. Colvin _____ Mr. L. E. Miller, were in the lumber _____ . To meet the needs _____ increased construction and development, in 1963 _____ started building the cement _____ . Three years later it _____ operating as Santee Cement _____ .

The plant's growth has _____ that of the sun _____. In the 1960's, the _____ for construction material rapidly _____ as development flourished. In fact, _____ the original plant (which was _____ to produce 350,000 tons of cement per year) _____ into production, it was _____ to see that demand _____ cement was greater than _____ . As a result, a second _____ of the plant was _____ which increased the plant's capacity three-fold to 1,200,000 _____ of cement.

The plant has two _____ cement kilns, the rotating cylindrical _____ where cement is actually _____ . Our largest cement kiln is 18 1/2 feet in diameter and 580 feet long. It is the second largest cement kiln in the United States.

Lesson # 7

LESSON OBJECTIVES:

Upon completion of this lesson, the participants, working in collaborative groups, will be able to:

1) identify and list words that they are unsure of the meaning or pronunciation.
2) demonstrate the ability to use the dictionary as a reference to clarify meaning and pronunciation.
3) demonstrate the ability to completely fill out the Insurance Reimbursement Form by handing in a completed form they will fill out in class.
4) collect the information needed to complete a dependent Insurance Information Sheet and maintain this as a future reference.

Materials:

Memo #7
Insurance Reimbursement Forms
(Medical -white form- and Dental -yellow form- are separate forms that require exactly the same information)
Insurance Information Sheet
pencils/pens

MEMO #7

TO: CEMENT Class
FROM: M. L. Taylor
DATE: 12 January 1994
RE: Insurance Forms

The main task for this class is to learn how to complete an insurance form. This will enable you to take advantage of the medical and dental insurance benefits that are offered to you. First, you need to read over the form. As you are reading, write down word(s) you do not know the meaning of or cannot pronounce. After you do this by yourself, discuss with your group the word(s) you have written down: does any one in your group have the same word(s); are there words that you are able to help others with; are there words that others could help you with?

When you finish, all the groups will report their discussions to the class. I will list the words on the board as we discuss them. Stop me and ask questions if you do not understand.

Next, we will take the time to go back through the form and discuss the information that goes in each block. You will notice that there is some information that you may not have, such as; spouse's soccial security number, and dependent's birthdates and social security numbers. To help you get this information, you will fill in the Insurance Information Sheet that I will give you. If you do not have the information needed with you, complete this sheet at home and bring it to the next class. This sheet will be very important to you in the future as you file your insurance claims.

After we have thoroughly discussed the form, you will complete it. Remember, you are to fill in the information as if you were actually filing this claim.

I will be moving around the room to help you, if you get stuck and I am busy ask someone near you. I want to see your completed form before you leave.

Keep the completed form to use as an aid any time that you need to file a medical (white form) or dental (yellow form) insurance claim.

Insurance Information Sheet

In the next class we will be completing an Insurance Claim Form, in order to complete this form for one of your dependents you will need to know some information about them.

Complete the list of the information on this page and bring it to the next class. Also, you will keep this sheet with completed copy of the Claim Form to use when you need to send off an Insurance Claim Form in the future.

Name of dependent Social Security Number Birthdate Sex Relationship

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Full-time Student Name of College Handicap Medicare

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

PART A — EMPLOYEE STATEMENT — Failure to Answer All Questions May Delay Payment

Employee's Name	Street Address	City or Town	Zip Code
1.			

Plan Number	Social Security No.	Certificate Number	Are You Still Employed?	If No, Date Last Worked
2. 50852 Must be Completed	Must be Completed	If Applicable	Yes ☐ No ☐	

Date of Birth	Marital Status	Name of Your Employer	Occupation
3.	Single ☐ Divorced ☐ Married ☐ Widowed ☐	HOLNAM INC	

Spouse's Date of Birth	Spouse's Social Security No.	Is your Spouse Employed	If Yes, Name and Address of Spouse's Employer
4.		Yes ☐ No ☐	

Are You or Your Dependents Covered Under Another Group Insurance or Government Plan Such as Medicare, an HMO or Automobile No Fault Coverage, Which Will Also Cover Any of the Medical Expenses on the Claim?	If Yes, Name and Address Policy Number / ID # Family Member Holding Policy
5. Yes ☐ No ☐	

Is Claim For a Dependent?	If Yes, Dependent Name	Sex	Date of Birth	Relationship To Employee	If Dependent is a Child, Are You Entitled to a Tax Exemption?
6. Yes ☐ No ☐	(first) (last)	Male ☐ Female ☐			Yes ☐ No ☐

If Child, is She/He Married?	Is Child Over 19?	If Yes, Full Time Student?	If Yes, Name of School
6(a) Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	

Is Claim for an Accident?	Date Time	Where Did It Occur?	While Working?	How Did it Occur?
7. Yes ☐ No ☐			Yes ☐ No ☐	

SIGN HERE IF YOU WANT BENEFITS PAID TO DOCTOR/HOSPITAL	Date
8.	

SIGN HERE FOR ALL CLAIMS I hereby authorize any insurance co., hospital, or physician to release all information which may have a bearing on benefits payable under this plan of benefits	Date
9.	

PART B — DOCTOR OR SUPPLIER — Complete and Return to Patient

	Date of Birth	Date First Consulted for Condition	Has Patient Ever Had Same or Similar Symptoms?	Name of Referring Physician
			☐ Yes ☐ No	

Date Patient Able to Return to Work	Dates of Total Disability From	Through	Dates of Partial Disability From	Through

Diagnosis or Nature of Illness or Injury *Relate Diagnosis to Procedure in Column D by Reference to Numbers 1, 2, 3, etc. or DX Code*	Is Condition Related To Work Incurred Injury or Illness?
1 3 2 4	Yes ☐ No ☐

A Date of Service	B Place of Service	C Fully Describe Procedures, Medical Services or Supplies Furnished for Each Date Given — Procedure Code (Identify:) (Explain Unusual Services or Circumstances)	D DX Code (ID)	E Charges

Signature of Physician or Supplier	Total Charges	Amount Paid	Balance Due
Signed _____ Date _____			

Provider's Social Security No /Tax ID No	Physician's or Supplier's Name, Address, Zip Code	Telephone No. ( )

PLACE OF SERVICE CODES

1 (IH)—INPATIENT HOSPITAL
2 (OH)—OUTPATIENT HOSPITAL
3 (O)—DOCTOR'S OFFICE
4 (H)—PATIENT'S HOME
5 —DAY CARE FACILITY
6 —NIGHT CARE FACILITY (PSY)
7 (NH)—NURSING HOME
8 (SNF)—SKILLED NURSING FACILITY
9 —AMBULANCE
10 (OL)—OTHER LOCATIONS
11 (IL)—INDEPENDENT LABORATORY
12 —OTHER MEDICAL/SURGICAL FACILITY

SEE REVERSE SIDE FOR FILING INSTRUCTIONS

BEST COPY AVAILABLE

PART A — EMPLOYEE STATEMENT — Failure to Answer All Questions May Delay Payment

Employee's Name	Street Address	City or Town	Zip Code
1.			

Plan Number	Social Security No.	Certificate Number	Are You Still Employed?	If No, Date Last Worked
2. 50852 Must be Completed	Must be Completed	If Applicable	Yes ☐ No ☐	

Date of Birth	Marital Status	Name of Your Employer	Occupation
3.	Single ☐ Divorced ☐ Married ☐ Widowed ☐	HOLNAM INC	

Spouse's Date of Birth	Spouse's Social Security No.	Is your Spouse Employed	If Yes, Name and Address of Spouse's Employer
4.		Yes ☐ No ☐	

Are You or Your Dependents Covered Under Another Group Insurance or Government Plan Such as Medicare, an HMO or Automobile No Fault Coverage, Which Will Also Cover Any of the Dental Expenses on the Claim?	If Yes, Name and Address Policy Number / ID # Family Member Holding Policy
5. Yes ☐ No ☐	

Is Claim For a Dependent?	If Yes, Dependent Name	Sex	Date of Birth	Relationship To Employee	If Dependent is a Child, Are You Entitled to a Tax Exemption?
6. Yes ☐ No ☐	(first) (last)	Male ☐ Female ☐			Yes ☐ No ☐

If Child, is She/He Married?	Is Child Over 19?	If Yes, Full Time Student?	If Yes, Name of School
6(a) Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	

Is Claim for an Accident?	Date Time	Where Did It Occur?	While Working?	How Did it Occur?
7. Yes ☐ No ☐			Yes ☐ No ☐	

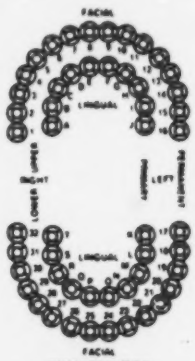
SIGN HERE IF YOU WANT BENEFITS PAID TO DOCTOR/HOSPITAL	Date
8.	
SIGN HERE FOR ALL CLAIMS I hereby authorize any insurance co., hospital, or physician to release all information which may have a bearing on benefits payable under this plan of benefits.	Date
9.	

PART B — DENTIST'S STATEMENT

CHECK ONE: ☐ DENTIST'S PRE-TREATMENT ESTIMATE ☐ DENTIST'S STATEMENT OF ACTUAL SERVICES

PATIENT'S NAME (First name, middle initial, last name)	PATIENT'S DATE OF BIRTH	HAS ANY OTHER GROUP INSURANCE CARRIER BEEN BILLED FOR THESE SERVICES? ☐ YES ☐ NO

IDENTIFY MISSING TEETH WITH "X"



REMARKS FOR UNUSUAL SERVICES

	NO	YES	
IS TREATMENT RESULT OF OCCUPATIONAL ILLNESS OR INJURY			IF YES, ADVISE DATE AND DETAILS
IS TREATMENT RESULT OF AUTOMOBILE OR OTHER ACCIDENT			IF YES, ADVISE DATE AND DETAILS
IF PROSTHESIS, IS THIS INITIAL PLACEMENT			IF NO , REASON FOR REPLACEMENT / DATE OF PRIOR PLACEMENT
IS TREATMENT FOR ORTHODONTICS			DATE APPLIANCES PLACED

EXAMINATION AND TREATMENT PLAN—LIST IN ORDER FROM TOOTH NO. 1 THROUGH TOOTH NO. 32—USE CHARTING SYSTEM SHOWN

TOOTH # OR LETTER	SURFACE	DESCRIPTION OF SERVICE (INCLUDING X-RAYS, PROPHYLAXIS, MATERIALS USED, ETC.) LINE NO.	DATE SERVICE PERFORMED MO DAY YEAR	PROCEDURE NUMBER	FEE
		1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			

Signature of Dentist	Total Charges	Amount Paid	Balance Due
Signed _____ Date _____			

X-Rays Enclosed	Provider's Social Security No./Tax ID No.	Dentist's Name, Address, Zip Code	Telephone No.
Yes ☐ No ☐			( )

SEE REVERSE SIDE FOR FILING INSTRUCTIONS

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Lesson # 8

LESSON OBJECTIVES:

Upon completion of this class the participants, working in collaborative groups, will be able to:

1) distinguish the uses for the first four forms used in the Inventory Control.
2) correctly add columns of pre-recorded inventory count.
3) record inventory count in the proper space on forms 1 - 4.

Materials:

Memo # 8
Forms 1, 2, 3, and 4 used for Inventory Control records
paper/pens/pencils
calculators

Memo # 8

To: CEMENT Class
From: Lou Taylor
Date: July 20,1994
Subj: Inventory Control

We are having some problems with the Inventory Control Process being used in the Packhouse. Let's take some time and review all of the forms being used. We will work with these forms during classes 8 and 9.

There are seven (7) forms used in the entire process and we will go through them one at a time. I have numbered the forms (1-7) in the order that they are used. Forms 1, 2, 3, and 4 are used to record the actual floor count. Forms 5, 6, and 7 are used to total (or tally) forms 1 - 4.

In this class, we will be looking at the first four forms. These forms are set up to record the actual count of products on the floor. The number of pallets counted is recorded in a box under the product type. Forms 1, 2, and 3 have product names and/or type and how high the pallet is stacked preprinted at the top of the form. The products on forms 1, 2, and 3 are usually kept in inventory. Form 4 is left blank because there are some products that are not usually found in inventory but that we have on hand for various reasons. When you find a product that is not listed on forms 1 -3 then you use form 4. You must remember to write the product name, type or identifying code number on the form, then count and record how high the pallet is stacked and the number of pallets.

When you look at forms 1- 4, you will noticed that they already have numbers recorded on them. Look closely and you will see that these numbers have not been totaled. Your assignment is to total each column on these four forms. Record your answers in the area marked "Total Pallets for Inventory." When you finish we will review your answers.

We will work with forms 5, 6, and 7 in the next class.

	I	II	III	N	BUFF-N	M	CLS	HPS	HS	CLM	STUCCO
	7	7	7	9	9	9	9	9	9	8	9
OF ALLETS	18	15	64	210	75		20	108	36		18
	12	15		12	1		32	45			21
	12	40		6	32		56	21			36
	48	32		8	32		56				27
	50			5	212		107				
	24			31	84						
	24										
	24										
	16										
	18										
	87										
BAGS ON ROKEN ALLETS	3/6			12/5	7						4/4
	2/5			4/6							
	8			8/3							
OTAL ALLETS N FLOOR											
LUS ALLETS ACKED FTER NV IS AKEN											
INUS ALLETS OADED N FLATS FTER INV S TAKEN											
OTAL ALLETS OR NVENTORY											
OTAL AGS ON P											

1

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	ROSE MORTAR	WH MORTAR	BLACK MORTAR	SALMON MORTAR	RED MORTAR	DARK MORTAR			BUFF HPS	ROSE HPS	BROWN HPS		SALMON HPS	RED HPS	DARK HPS			BUFF CLS	ROSE CLS	BROWN CLS	BLACK CLS	SALMON CLS	RED CLS			
# HIGH	9		9	9	9	9			9	9	9		9	9												
# OF PALLETS	16		18		10	18			8		20		16	3												
	10		20		6	18			12		32			2												
	3		37		23	26			6		8															
	24		5		45	32			20		7															
						52					32															
NUMBER BAGS ON BROKEN PALLETS																										
TOTAL PALLETS ON FLOOR																										
MINUS PALLETS LOADED AFTER INVEN IS TAKEN																										
TOTAL PALLETS FOR INV																										
TOTAL # BAGS ON BROKEN PALLETS																										

2

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	SANTEE WHITE CEMENT		SANTEE WHITE MORTAR - TYPE S		MORTASEAL LIME			
	7 HIGH		8 HIGH		10 HIGH			
OF ' ETS	48		9		54			
	73		16		17			
	40		4		8			
	8		5					
	15		20					
	64							
	112							
	80							
BAGS ON ROKEN ALLETS	16		2		3/			
	4		4					
	12							
OTAL ALLETS N FLOOR								
INUS ALLETS OADED ON LATS FTER NVENTORY S TAKEN								
OTAL ALLETS OR NVENTORY								
AGS ON ROKEN ALLETS								

3

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INVENTORY FLOOR STOCK

TYPE	# PALLETS	# BAGS	# HIGH
Federal White S	10/6/32/7		8
" " N	16/24/9		8
" " I	34/12/9		7
Limestone N THS	8	12	8
Honeysuckle N THS		36	

4

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Lesson # 9

LESSON OBJECTIVES:

Upon completion of this lesson the participants, working in collaborative groups, will be able to:

1) distinguish the uses for Inventory Control forms 5, 6, and 7.
2) enter correct information in the appropriate boxes on the above mentioned forms.
3) multiply to find the number of bags on a pallet.

Materials:

Memo # 9
Inventory Control forms 5, 6, and 7
paper/pens/pencils
calculators

Memo # 9

To: CEMENT Class
From: M.L. Taylor
Date: July 22, 1994
Subj: Inventory Control

In class #8 we concentrated on the first 4 of the forms. Now we will spend our time going over the rest of the forms.

Forms 5, 6, and 7 are used to compile all the information from the first four forms. In order to complete these forms you will need to look at the forms we completed in class #8.

Let's begin with form 5, look at the information that we will enter on this form. Do we have this information? Where is it? Type I, II, III, N, M, CLS, HPS, HS (75 lb) are all on form 1. Santee White Type S, Santee White Cement, and Mortar Seal Lime are on form 3. Look at form 1, type I, what is the total for inventory of that column? (333 pallets) Enter the number of pallets in the last column on form 5 marked "Total Pallets." How do you find out how many bags are in inventory? (multiply the number of pallets by how many bags on a pallet) So, if type one is stacked 7 rows high with 5 bags on one row, then there are 35 bags on a pallet of type I (7 x 5 = 35). Now to find the number of bags on 333 pallets multiply 333 by 35. (333 x 35 = 11655) Enter the 11,665 in the column for "Total Bags."

Follow the same procedure for each product. Be careful when figuring how many bags are on a pallet. Watch the number high, this changes for some products. There are always 5 bags on one row.

Before you start form 6, check off all the product that you entered onto form 5 from forms 1 and 3. Are any products not checked off? (yes, CLM and Stucco) Look over forms 6 and 7. Are CLM and Stucco listed on them? (no) Where should we put the information on CLM and Stucco? (on form 5) Notice that the last four lines on form 5 are blank. We can write CLM and Stucco in the "Type" column and record the information for these products there.

Look at form 6, where is the information for these products listed? (form 2) Enter the information from form 2 onto form 6.

Form 7 is blank. Is there a information to put on this form? (yes, from form 4) Carefully enter this information. Remember to write the product name or type identification code in the "Type" column and watch the how high numbers.

INVENTORY - STOCK ON FLOOR

DATE: _____

MONTH: _____

TYPE		TOTAL BAGS	TOTAL PALLETS
I	X 35 =		
	X =		
II	X 35 =		
	X =		
III	X 35 =		
	X =		
N	X 45 =		
	X =		
M	X 45 =		
	X =		
CLS	X 45 =		
	X =		
HPS	X 45 =		
	X =		
HS (75 lb)	X 45 =		
	X =		
SANTEE WHITE TYPE S	X 40 =		
	X =		
SANTEE WHITE CEMENT	X 35 =		
	X =		
MORTAR SEAL LIME	X 50 =		
	X =		
	X =		
	X =		
	X =		
	X =		
	X =		
	X =		
	X =		
	X =		

TE/sbr(14)

5

INVENTORY - STOCK ON FLOOR

MONTH: _____

DATE: _____

TYPE			TOTAL BAGS	TOTAL PALLETS
	BUFF MORTAR	X 45 = | X =		
T	ROSE MORTAR	X 45 = | X =		
Y	BROWN MORTAR	X 45 = | X =		
P	BLACK MORTAR	X 45 = | X =		
E	SALMON MORTAR	X 45 = | X =		
N	RED MORTAR	X 45 = | X =		
	DARK MORTAR	X 45 = | X =		
	BUFF MORTAR	X 45 = | X =		
T	ROSE MORTAR	X 45 = | X =		
Y	BROWN MORTAR	X 45 = | X =		
P	BLACK MORTAR	X 45 = | X =		
-	SALMON MORTAR	X 45 = | X =		
H	RED MORTAR	X 45 = | X =		
P	DARK MORTAR	X 45 = | X =		
S	BUFF MORTAR	X 45 = | X =		
	ROSE MORTAR	X 45 = | X =		
T	BROWN MORTAR	X 45 = | X =		
Y	BLACK MORTAR	X 45 = | X =		
P	SALMON MORTAR	X 45 = | X =		
E	RED MORTAR	X 45 = | X =		
C	DARK MORTAR	X 45 = | X =		
L				
S				

TE/sbr(14)

6

INVENTORY - STOCK ON FLOOR

DATE: _____

MONTH: _____

TYPE		TOTAL BAGS	TOTAL PALLETS
	X =		
	X =		
	X =		

Lesson # 10

LESSON OBJECTIVES:

Upon completion of the lesson, the participants, working in collaborative groups, will be able to:

1) arrange eight (8) words in alphabetical order.
2) evaluate the dictionary definition of a word used in the workplace.
3) identify an alternative resource, other than the dictionary, to aid in the defining of words.
4) enter date into their Vocabulary Handbook
5) evaluate and solve work-related math problems using multiplication or division.

Materials:

Memo #10 (contains word list and math problems)
Dictionaries
Cement Glossary
pencils/pens

MEMO # 10

To: CEMENT Classes
From: Lou Taylor
Date: February 16, 1994
Subj: 1) Workplace Vocabulary
1) Refractory Math

First, you will use the eight words below and find their definition in the dictionary. It may be helpful to put the words in alphabetical order first. Then find the word, read the definition and ask yourself, "Does this tell me the meaning of the word as I use it at work?" If it does, write the definition in the vocabulary section of your Vocabulary Workbook. If it does not, then go on to the next word and repeat the process. When you finish, we will discuss the words that you could not match the definition and use at work.

marl	shim
fly ash	refractory
palletizer	finish mill
needles	slurry

You will write the definitions in the vocabulary section of your notebooks, this begins on page 5.

The second task is to solve the problems on the following page. We have gotten some of the figures for the kiln outage and are reviewing the formulas to order supplies. Let's look over the problem carefully and use the formulas to help order the supplies. The formulas to solve the problems are given.

A) If a 6" (0.5 foot) thick layer of castable (refractory) is to be installed, what is the volume of the refractory?

Volume = length x width x height

OR

Volume = area x thickness

Volume = 581.2 square feet x 0.5 ft.

B) What will be the weight of the refractory?

Weight = cubic feet x weight per cubic foot

Weight = 290.6 cubic feet x 160 pounds per cubic foot

C) The refractory material requires 3% water for mixing. How much water will be required for mixing?

Water = weight of refractory X 0.03

D) Stainless steel needles (4%) will be added to the mix to prevent cracking. How many pounds of needles will be needed?

Pounds of needles = weight of refractory x 0.04

E) The mixer only holds 2000 pounds of dry refractory mix at a time. How many mixes will be required?

Number of Mixes = weight of refractory - 2000

Lesson # 11

LESSON OBJECTIVES:

Upon completion of this lesson the participants, working in collaborative groups, will:

1) state the difference between military and standard time.
2) state that military time runs on a 24 hour clock.
3) record given standard times in military notation.
4) translate military time into standard time format.

Materials:

Memo # 11
Standard and Military Time Handouts
1 - Standard and Military Time (2 page explanation and exercise)
2 - Standard and Military Time Worksheet #1
paper/pens/pencils
thinking caps

Memo #11

To: Continuing Education Foundation
From: M. L. Taylor
Date: July 6, 1994
Subj: Military -vs- Standard Time

As you are aware, Military Time is used throughout the plant on shift logs and on work orders. Today we are going to learn about using of the Military Time system. We'll begin by looking over the attached information sheet and then we'll complete a worksheet (or two) on using this "new system."

While the Military Time system is new to us, it has been in use for many years. Remember that this is a different way to tell time than the way we are used to (called Standard Time) and that means it is not necessarily harder - just different!

So **pay attention** and **ask questions** as we learn a ***different*** way to tell time.

Standard and Military Time

We use Standard Time to tell the time of the day. Standard Time uses a 12 hour clock and the abbreviations A.M. and P.M. to show morning or evening.

In the military, time is told on a 24 hour clock and the abbreviations A.M. or P.M. are not used. When we first hear time stated in Military Time, it sounds funny because we are not used to it. There are 24 hours in a day and it is important to remember that midnight is the 2400 hour (or the end of the day). Time for the next day begins at 0001 (1 minute after midnight) when the new day is just one minute old. Military Time is written with four digits, the first two digits represent the hour of the day and the last two digits represent the minutes. Look at the example below that shows how Military Time is written and what the place value of the numbers are:

0000

hour minutes

Some examples of Military Time and their conversion to Standard Time are listed below to help you understand.

Examples:

	Military Time	Standard Time
1)	0815	8:15 AM
2)	0630	6:30 AM
3)	1400	2:00 PM
4)	1200	12:00 Noon
5)	2045	8:45 PM

Why do I need to know about Military Time?

At Holnam the Supervisors Shift Logs are kept with Military Time noting the occurrence of anything that happens during their shift. You may hear Military Time being referred to in the Control Room or by your Supervisors and not known what they meant. Well hang on we're about to break their secret code!

Standard and Military Time Exercises

Reading Military Time:

0800 is said "zero eight hundred hours" or "eight hundred hours"

1130 is said "eleven thirty hours"

1545 is said "fifteen forty-five hours"

2310 is read "twenty three ten hours"

Now try to write the time in Military Time for the words below:

1) seventeen twenty-six hours _____

2) zero three fifteen hours _____

3) twenty-one thirty hours _____

4) ten nineteen hours _____

5) zero one twelve hours _____

6) nine twenty-five hours _____

7) twenty-four hundred hours _____

8) zero fifteen hours _____

9) four thirty-five hours _____

10) sixteen fifty-five hours _____

Standard and Military Time - Worksheet #1

Write the following Standard Times in Military Time.

1) 4:14 P.M. = _____

2) 7:00 A.M. = _____

3) 5:00 P.M. = _____

4) 2:30 A.M. = _____

5) 3:45 P.M. = _____

Write the following Military Times in Standard Time:

6) 0815 = _____

7) 2345 = _____

8) 1700 = _____

9) 1930 = _____

10) 2115 = _____

11) 0830 = _____

12) 1445 = _____

13) 2400 = _____

14) 1115 = _____

15) 0600 = _____

Lesson # 12

LESSON OBJECTIVES:

Upon completion of this lesson the participants, working in collaborative groups, will:

1) compose and submit a written memo concerning the class topics that have been covered and their thoughts on these topics and include suggestions for future classes.
2) review the use of military time and demonstrate proficiency by completing exercises with at least 90 % accuracy.
3) identify mistakes and correctly solve refractory math problems when given problems with incorrect answers.
4) identify and correct mistakes on an Inventory Control form.

Materials:

Memo #12
Memo Response Form
Refractory Math Exercise Sheet (with mistakes in the math)
Inventory Control Form 7 (with mistakes)
paper/pens/pencils
calculators

Memo #12

To: CEMENT Class
From: Lou Taylor
Date: August 10, 1994
Subj: 1) Class Assessment Memo
2) Review of
a - Military Time
b - Refractory Math
c - Inventory Control Form 7

First, I need your advice. Please write a memo to me with your thoughts about the CEMENT Program. Tell me how you liked the classes, what you liked best, what you liked least or did not like at all. Also, tell me what you would like to learn about in future classes which will start soon.

I really value your opinion and will use your comments to help plan what we will cover in future classes.

Next, we will review some of the topics from this round of classes. We will start with Military Time. You will receive an exercise sheet with examples of time, follow the directions on the page.

The next task involves checking some work on refractory math. Pretend that you have done the math on the worksheet and are checking it to turn in. Use your calculators to check the math and **make corrections** when you find a mistake.

The last task involves finding mistakes on Inventory Control Form 7. Be careful there because some of the figures are correct. HINT: check all of the totals and the math to figure out the number of bags.

Wow! There's a lot of work to get done in this class, so let's get busy. Remember that you are working in your groups and can help each other out.

Memo Response Form

To: _____

From: _____

Date: _____

Subj: _____

Standard and Military Time

Here are some examples of Standard and Military Time:

12:45 A.M. = 12:45 A.M. (standard) = 1245 (military)
9:00 A.M. = 9:00 A.M. (standard) = 0900 (military)
5:15 P.M. = 5:15 P.M. (standard) = 1715 (military)
9:00 P.M. = 9:00 P.M. (standard) = 2100 (military)

Remember: Military Time uses a 24 hour clock. Write the following times in both Military and Standard times.

	Standard	Military
3:15 P.M. =	_____	_____
6:00 A.M. =	_____	_____
12:00 A.M. = (Noon)	_____	_____
6:00 P.M. =	_____	_____
4:30 P.M. =	_____	_____
11:00 A.M. =	_____	_____
12:00 P.M. = (Midnight)	_____	_____
4:45 A.M. =	_____	_____
10:30 A.M. =	_____	_____
8:00 P.M. =	_____	_____

Next, here are some excerpts from the Shift Log. Notice that the time is in Military format. Change the time to Standard.

A) Work order HH339988 written at 0900. _____
B) Repairs to Wash Mill completed at 1430. _____
C) W.O.W. for repairs to slurry line at 1730. _____
D) Repairs to slurry line completed at 2200. _____
E) Work begun on WO JJ000009 at 1130. _____

Refractory Math Exercises

1) Compute the weight of castable refractory with a volume of 290.6 cubic feet. Castable refractory weighs 160 pounds per cubic foot.

Weight = cubic feet x 160

43,136 = 269.6 x 160

2) The refractory material requires 3% water for mixing. How much water will be required for this job?

Water = weight of refractory x .03

1294.08 = 43136 x .03

3) Stainless steel needles will be added to the castable refractory to prevent cracking. To calculate the amount of needles needed multiply the total weight of the refractory by 4%.

Pounds of Needles = weight of refractory x .04

1725.44 = 43136 x .04

4) The mixer holds 2000 pounds of dry refractory at one time. How many mixes will be required to complete this job?

Number of mixes = weight of refractory -- 2000

215.68 = 43136 -- 200

Pre-Test

and

Post Test

CEMENT
Participant Pre-Survey

Name: _____ Date: _____

Directions: Solve the following problems. Read over all the information carefully and take your time to answer. THINK !!!

Section I - Refractory Math

Information:

* The circumference of the kiln is 58.1 feet.
* Refractory work is to be done on a 12 foot length of the kiln.
* The area that the refractory will cover is 697.2 square feet.
* Watch out for decimal points !

1) How many stainless steel anchors will be required for installation? There are four anchors needed for each square foot of installation.
n = (square feet) x (anchors per square foot)

697.2 x 4 =

2) If a 6" (.5 foot) thick layer of castable refractory is to be installed, what will be the volume of the refractory?
v = (area) x (thickness)

697.2 square feet
x .5 foot

3) How much water will be required for mixing? The refractory weighs 55,776 pounds.

n = (weight of refractory) x (3%)

55,776 pounds
x .03

4) The mixer only holds 2000 pounds of dry refractory at a time. How many mixes will be required for this job?

n = (weight) - (2000)

2000) 55,776

Section II: 24 - Hour Clock

Directions: There are several questions below that state the time using the 24 hour clock. Look at the times and choose the correct standard time that matches it.

1) The work was completed at 0715. When is 0715?
   a) 7:15 AM
   b) 7:15 PM
   c) 5:27 AM

2) The accident occurred at 1400. When is 1400?
   a) 1:40 PM
   b) 2:00 PM
   c) 10:40 AM

3) Can the job be done before 2230? When is 2230?
   a) 2:30 AM
   b) 10:30 PM
   c) 3:20 PM

4) The work was finished at 0845. When is 0845?
   a) 8:45 AM
   b) 8:05 PM
   c) 6:45 PM

Section III: Vocabulary

Directions: Match the following words to the correct definition by writing the word on the line in front of the definition.

Marl Clinker Refractory Jackhammer

_____ The product of the kiln which is used to make cement.

_____ A rock drill operated by compressed air.

_____ Kiln lining that can withstand high temperatures without fusing.

_____ A soft raw material, one of the ingredients for cement.

Section IV: Packhouse Inventory (Math)

Directions: Look at the next page (page 4), this is one of the counting sheets for the Inventory Control Process in the Packhouse. It is partially filled out, please add each of the columns and enter the total in the box labeled "Total Pallets for Inventory".

	I 7	II 7	III 7	M 9	BUFF-M 9	M 9	CLS 9	HPS 9	HS 9	CLK 8	STUCCO 9
# OF PALLETS	64	24	48	126	276		56	145	36		36
	18	24	48	36	85		112	18	24		36
	218	16	12	54				48			24
	24	32		12				62			12
	154	70									18
	80										9
	96										
	21										
	192										
# BAGS ON BROKEN PALLETS											
TOTAL PALLETS ON FLOOR											
PLUS PALLETS PACKED AFTER INV IS TAKEN											
MINUS PALLETS LOADED ON FLATS AFTER INV IS TAKEN											
TOTAL PALLETS FOR INVENTORY											
TOTAL BAGS ON BROKEN PALLETS											

1

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CEMENT
Participant Post Survey

Name: _____ **Date:** _____

Directions: Solve the following problems. Read over all information carefully and take your time to answer. THINK ! ! !

Section 1 - Military Time (the 24 hour clock)
Directions: Next, here are some excerpts from the Supervisor's Shift Log. The times are stated in Military Time. On the line at the end of each statement write the Standard Time for the Military Time given in the sentence.

1) Repairs on #4 raw mill completed at 0300 hours. _____

2) WO 640921GR work began at 1530 hours. _____

3) #1 Kiln shut down at 0615 due to hot spots. _____

4) #4 Raw Mill up and running at 0315. _____

5) WO 399599YX completed at 2200. _____

Section 2: Refractory Math
Directions: Solve the following problems. Since we have been learning to use the calculator during this cycle, you are allowed to use the calculator to solve these problems.
Information:

* The circumference of the kiln is 58.1 feet.
* Refractory work is to be done on a 16 foot length of the kiln.
* The area that the refractory will cover is 929.6 square feet.
* Watch out for the decimal points! ! !

6) How many stainless steel anchors are needed for the installation? There are four anchors required for each square foot installed.

(square feet) x (anchors per square foot) = n

926 x 4 =

7) If a 6" (.5 foot) thickness of castable refractory is to be installed, what will be the volume of the refractory?

(area) x (thickness) = v

3718.4 x .5 =

8) What will be the weight of the refractory? Refractory weighs 160 pounds per cubic feet.

(volume) x (weight per cubic foot) = refractory weight

1859.2 x 160 =

9) Stainless steel needles are added to the refractory mix. If 4% of the mix is to be needles, how many needles will be needed?

(weight) x (.04) = needles needed

297472 x .04 =

10) The 3% water needed to mix the refractory will weigh 8924.16 pounds. Since water is measured in gallons, we must convert pounds to gallons. A gallon of water weighs 8.3 pounds. If we divide weight of the water by 8.3, we will get how many gallons of water will be needed.

(weight of water) - (8.3 pounds per gallon) = gallons of water

8924.16 - 8.3 =

11) The mixer holds 2000 pounds of dry refractory at one time. How may mixes will have to be made?

(weight of refractory) - 2000 = number of mixes needed

297472 - 2000 =

Section III: Company Memo

Directions: On the next page (page 4) is a memo from Sandra Griffin, please read it carefully and answer the following questions.

12) What is this memo about?

_____ A) Group Universal Life (GUL) Enrollment

_____ B) A problem with the seagull population in the marsh west of the plant.

13) What will you find enclosed in the letter?

_____ A) A letter form Linda Strouse from Holnam, Inc.

_____ B) A letter form the CIGNA Group Insurance with additional information and enrollment form.

14) If you do not get this new plan on your spouse and dependents, do you have to turn anything in?

_____ A) No, just throw it all away.

_____ B) Yes, everyone must turn in the election form whether you get the insurance or not.

15) When does all the information from you need to be turned in to Sandra?

_____ A) February 18, 1994

_____ B) February 25, 1994

_____ C) February 23, 1994

Section IV: Inventory Control

Directions: On page 5 of this survey is an **Inventory - Stock on Floor** sheet. You will notice that the form is not filled out completely, please fill out the form and check the work that is already on it. (there could be a mistake)

HOLNAM INC

INTERNAL CORRESPONDENCE

To: ALL EMPLOYEES
(WHO HAVE LOST SUPPLEMENTAL AND/OR DEPENDENT LIFE COVERAGE)

From: S. GRIFFIN

Date: FEBRUARY 18, 1994

Subject: GROUP UNIVERSAL LIFE (GUL) ENROLLMENT

YOU WILL FIND ENCLOSED A LETTER FROM LINDA STROUSE, HOLNAM, INC. AND A LETTER FROM CIGNA GROUP INSURANCE WITH ADDITIONAL INFORMATION AND ENROLLMENT FORM FOR THE GUL PLAN. THIS IS A FOLLOW UP OF THE LETTER YOU PREVIOUSLY RECEIVED FROM LINDA REGARDING ELIMINATION OF YOUR SUPPLEMENTAL LIFE AND DEPENDENT LIFE INSURANCE COVERAGE BY HOLNAM. (THIS IS LIFE INSURANCE ONLY AND DOES NOT AFFECT YOUR MEDICAL INSURANCE COVERAGE).

YOU NO LONGER HAVE ANY LIFE INSURANCE COVERAGE THROUGH HOLNAM, INC. ON YOUR SPOUSE AND/OR DEPENDENTS. PLEASE READ ALL INFORMATION CAREFULLY AND RETURN TO PERSONNEL AS SOON AS POSSIBLE. THERE IS A PLACE ON BACK OF ENROLLMENT FORM TO SIGN IF YOU DO NOT ELECT TO ENROLL, THEREFORE, **EVERYONE** SHOULD RESPOND, EVEN IF YOU DO NOT CHOOSE TO ENROLL.

WE WILL NEED THESE BACK NO LATER THAN **WEDNESDAY, FEBRUARY 23**, IN ORDER TO HAVE TO CIGNA BY FEBRUARY 25. IF YOU HAVE ANY QUESTIONS OR NEED HELP WITH YOUR FORM, I PLAN TO BE IN THE PLANT LUNCHROOM MOST OF THE DAY WEDNESDAY, OR YOU CAN GIVE ME A CALL ANYTIME BEFORE THEN.

REMEMBER, DEADLINE IS FEBRUARY 23, 1994.

INVENTORY - STOCK ON FLOOR

DATE: 5/11/94

MONTH: MAY

TYPE		TOTAL BAGS	TOTAL PALLETS
I	34 X 35 = 1190	1190	34
	X =		
II	356 X 35 =		
	X =		
III	403 X 35 =		
	X =		
N	191 X 45 =		
	X =		
M	5 X 45 = 225	225	5
	X =		
CLS	397 X 45 =		
	X =		
HPS	263 X 45 =	11,835	
	X =		
HS (75 lb)	24 X 45 =	1080	24
	X =		
SANTEE WHITE TYPE S	10 X 40 =	400	10
	X =		
SANTEE WHITE CEMENT	9 X 35 =		
	X =		
MORTAR SEAL LIME	26 X 50 =	1300	26
	X =		
	X =		
	X =		
	X =		
	X =		
	X =		
	X =		
	X =		

TE/sbr(14)

Reciprocal

Reading

TEACHER'S GUIDE
FOR PERFORMING WORK:
TASK # 01

I. PROCESS AND CONTENT OBJECTIVES

A. GENERAL STATEMENT: *One objective of this course is to get the participants to use a specific technique to develop good reading skills. Reading is considered a process skill here since we read in the workplace to perform a task. Reading in this course is regarded as a tool to perform work better.*

Reading aloud in class is required in this particular technique but it is not intended to embarrass anyone. Reading aloud is done to develop each participant's reading and comprehension skills. The lesson is based on a technique called Reciprocal Teaching, explained in more detail below. You will see that the Reciprocal Teaching techniques reinforce and support the different kind of teaching methods this course emphasizes.

A content objective of TASK 01 is to have the participants understand the cooperative (not competitive) nature of the learning that will take place in this course. Just following the Reciprocal Teaching method reinforces this cooperative method of learning.

Another content objective is to get the participants to understand the process that will be used in this course. (Notice how process can become content! This is an example of the integration of process and content.) This objective is important because this course is not like the school courses that emphasized abstract academic learning. Most adult participants in a workplace literacy course did not do particularly well in the regular classroom. Therefore, this course will be conducted as a dialogue among participants and teacher about reading, learning, thinking, and problem-solving.

Notice how the methods of Reciprocal Teaching reinforce the goals set forth in the MEMO TO THE CLASS.

B. BACKGROUND: *The Reciprocal Teaching reading activity was inspired by an article entitled "Students Make Gains Taking Turns 'Being the Teacher'," [Thinking About Thinking, found in Education Week Special Report, October 9, 1991, pages 14-15]. Here's a brief excerpt to indicate how it works:*

> *The children learned to ask for clarification when they came upon words they did not understand. They took turns "being the*

teacher" and asking their classmates questions about the texts that they were reading. And they practiced summarizing aloud the passages that they had read and predicting what would happen next.

The four strategies that undergird the reciprocal-teaching method are the product of years of study on how experts read and comprehend material.

The activities--summarizing, questioning, clarifying, and predicting--were chosen because they offer a dual function: They teach pupils to read and, at the same time, to monitor their understanding.

Don't dismiss these ideas because they are directed at children. The strategies are very pertinent to anyone wanting to improve his/her reading ability. (I have modified the suggested methods below based for use with adults. This modification is not intended to detract from the underlying soundness of the method.) The entire article gives more of the background for using this technique.

Annemarie Sullivan Palincsar and Ann L. Brown, the developers of Reciprocal Teaching, state the basis of the method in ASCD's 1989 Yearbook:

Reciprocal Teaching focuses less on teacher explanation and strategies, putting greater emphasis on teachers and students collaborating to bring meaning to the text.

At the heart of Reciprocal Teaching is a dialogue about the meaning of the text. The dialogue is structured with the use of the four strategies that promote comprehension of text and monitoring of comprehension.

The teacher and students take turns leading this dialogue, breaking the text into segments (initially by paragraphs). The discussion is focused on generating questions from the text, summarizing the text, clarifying portions of the text that impaired understanding, and predicting the upcoming content, based on clues that are provided by the content or structure of the text.

Annemarie Sullivan Palincsar and Ann L. Brown, "Instruction for Self-Regulated Reading," in Toward the Thinking Curriculum: Current Cognitive Research, edited by Lauren B. Resnick and Leopold E. Klopfer, ASCD 1989 Yearbook, page 33.

***C. MODIFICATIONS:** For those of you who are familiar with this method, I have made a few changes based on the fact that the participants will be adults and not elementary students. Palincsar and Brown suggest introductory lessons with the instructor assuming principal responsibility for leading the discussion. Modeling reading the first paragraph is the only introductory lesson as such provided here. Of course, the teacher has to explain how the material will be read and the kinds of questions that are encouraged. The most important aspect of the introduction of the activity is to assure the participants that mistakes in reading and answers are acceptable. When the text is being read, the teacher should be prepared to start the discussion and help it along only if the participants have not. In other words, every opportunity should be given to the participants themselves to start the*

questioning and clarifying. Of course the teacher has to ask for the start of the summarizing stage and the start of the prediction stage at appropriate points and acts as a guide in the use of the methodology.

II. CONDUCTING THE EXERCISE

A. SET THE ATMOSPHERE: *Since Reciprocal Teaching requires participants to read, ask and answer questions, and otherwise actively participate in classroom activities, you must make it clear to the participants that making mistakes is all right. Emphasize that it is acceptable to make mistakes because that is how the learning will develop. Unless all participants feel comfortable to participate, not everyone will learn. It is the entire class', including the instructor's, responsibility to cooperate so that everyone has an opportunity to grow and learn.*

B. HAVE LEARNERS TURN TO PERFORMING WORK, TASK # 01, IN THEIR TASKBOOK:

C. MODEL: *Read the first paragraph aloud.*

Be deliberate, go slow, read every word. After the first sentence, stop and Think Aloud about the word <u>different</u>. "Something can only be different depending on what classes I had before. How can the writer know the class will be different since he or she doesn't know me? I am going to look for an explanation from the writer on how the class will be different or I won't believe him or her."

Ask for other questions from participants. Get the participants in the habit of asking these questions and looking for the answers in the remaining text.

Read the second sentence (slowly) and Think Aloud: "The writer tells me here that I will not work by myself. I'm not sure I like that. I thought I always worked by myself in school. Well, that is one reason for the writer saying the class will be different. I certainly don't understand the fact that the teacher is not going to give me information. That's what teachers are paid for and why I came to this program. If the teacher doesn't give me information, where will I get it?"

Ask for other comments from the participants on this sentence only. Again, get the participants in the habit of asking these questions and looking for the answers in the remaining text.

Read the third sentence (slowly) and Think Aloud: "First, the words 'actively involved' are underlined. This means that the writer thinks they are important. It may also be an explanation of why this class will be different. Was I actively involved in my education before? Listening to a teacher does not actively involve me. That's what the writer meant that this class will be

different. But I was confused by the list. First there were the letters A and B. Then there were numbers. I'm not sure what that means. It might mean that the most important things we will do in this class are think and learn how to learn. What does learn how to learn mean? In fact, what does thinking mean? Is it the same as the right answer?"

"I don't like reading aloud. But if I am going to improve my reading, reading aloud can help. I'll have to wait and see how this is handled. Explaining answers is a way to get actively involved . Maybe this has something to do with thinking also. Taking part in group activities is different from classes I used to attend. I don't know what using resources mean. Does this have anything to do with the teacher not giving me information but I may have to use resources to get it?"

ASK:

- *Do you have any comments about the techniques of clarifying, questioning, summarizing, and predicting.*

TELL:

- *In reading aloud in this class, you can also ask questions about how to pronounce a word or what a word means. These kinds of questions are encouraged. In addition getting help from the dictionary, we will also be exploring how to determine what a word means from context.*

- *Does anyone know how to determine what a word means from context? (Ask for learner's suggestions first. If none are forthcoming, you can explore the issue of using context for word meaning with any reading text you have available.)*

D. GUIDE THE LEARNERS IN READING ALOUD THE NEXT PARAGRAPH OF THE MEMO: *Call on a learner to read the second paragraph. It's only four words but have someone do it and ask for clarification, questions, summary, and predictions. During the reading, all participants, including the reader and you can stop the reading and ask for clarification of meaning and/or pronunciation. When questions are raised, allow the participants all the time necessary to come up with answers themselves. You can focus and direct the answers only after the participants have attempted to come up with answers. Let the knowledge come from the participants.*

Below are suggested questions to stimulate discussion in this phase. You will have to determine if these questions are appropriate for the level of the class. If they are not, then maybe one of the goals of the course would be to bring the class to the level where these questions are appropriate.

- *What do you think the word _____ means?*
- *What do you think the word _____ means in the context of this paragraph?*
- *Are there other meanings for the word _____? What are the other meanings?*
- *How do you know that word ____ in this paragraph means _____ and not _____?*

E. HAVE A LEARNER READ ALOUD THE PARAGRAPH AGAIN: *If the reader is hesitant and there are many interruptions, have the paragraph read again. (You might have the paragraph read again anyway the first few times this technique is used.) Try to have participants connect what those paragraphs say with the opening paragraph you had read. Try to make as many connections as possible, because that's what reading is, making connections to what we already know or have already read.*

F. GUIDE LEARNERS IN SUMMARIZING THE PARAGRAPH: *Then ask someone other than the reader to summarize what the paragraph said. Have other participants comment on the summary or give a different version. Again, guide the participants' summaries toward a model of a good summary.*

G. GUIDE A DIFFERENT LEARNER IN REPEATING THE PROCESS FOR EACH PARAGRAPH: *This process should be used with each paragraph of the MEMO TO THE CLASS, even if it takes a long time. Don't forget you are attempting to have the participants experience a new way to learn to read with comprehension.*

This guide can't predict what you will find about the reading abilities of your participants, but be prepared to use every possible opportunity to overcome problems. If a problem is really basic, stop and have them read other, lower level material, doing all four steps--questioning, clarifying, summarizing, and predicting--until reading improves. If the class can handle the reading level of the memo, just continue the TASK as outlined below, because many of the TASKS in this course are based on this method and it will be used again with the other workplace material.

H. GUIDE THE LEARNERS IN A DISCUSSION OF THE ISSUES RAISED BY THE SYLLABUS: *After the entire MEMO TO THE CLASS has been read in the manner outlined above, discuss in general the participants' reaction to the kind of classroom described in the memo. Explain to them that everyone is responsible for his/her own learning. It is the teacher's responsibility to create an atmosphere that honors the slogan: "Cooperate, don't compete."*

I. LEARNER'S PERFORMING WORK: TASK 01 IS REPRODUCED BELOW.

Cement

Glossary

CEMENT PLANT GLOSSARY

Compiled by

C. F. CLAUSEN and W. R. DERSNAH

Reprinted from PIT and QUARRY, March and April, 1965

DATA LOG

AUTOGENOUS

NUCLEAR

SPECTROPHOTOMETER

PROGRAMMING

TV

DTA

EXPANSIVE CEMENT

COMPUTER

XRD

CEMENT PLANT GLOSSARY

Compiled by

C. F. CLAUSEN* and W. R. DERSNAH**

During their visits to nearly all the cement plants in the United States and Canada, the authors have frequently observed colloquialisms and widely differing usage of technical and operational terms in the field of cement manufacture. It is their hope that this glossary of words specific to cement making may be helpful in standardizing the terminology for the benefit of writers, secretaries, readers, speakers, and audiences, and that it will be useful to students and new employees in cement plants.

Since PIT AND QUARRY *published the original* CEMENT PLANT GLOSSARY *in April and May, 1956, manufacturing equipment and methods, as well as control procedures, have become considerably more sophisticated, as reflected in this revised and enlarged second edition.*

The few trade names mentioned in the glossary are included only because they have assumed a generic meaning.

The authors are grateful to Messrs. William Lerch (retired), H. H. Steinour (Portland Cement Association), and J. R. Tonry (Alpha Portland Cement Co.) for valuable comments and suggestions.

BEST COPY AVAILABLE

*Portland Cement Association
**Dundee Cement Co.

A

ABRASION-RESISTANT REFRACTORY
Hard-fired, dense, high-duty fireclay bricks (alumina-silica, containing less than 50 percent alumina) which resist physical wear or abrasion.

ACID REFRACTORY
High-silica and alumina-silica refractories. Alumina-silica materials vary in refractoriness or resistance to high temperatures; the higher the alumina content, the greater the refractoriness.

A.C.L. (trade name)
(see LEPOL KILN)

ACOUSTIC MILL FEED CONTROL
An electronic instrument used for control of mill feed rate based on changes in the noise level of the mill.

ADDITION
Material, other than gypsum or water, which is interground with clinker, in amounts not to exceed 2 percent. Includes grinding aids and air-entraining agents.

ADDITIVE
A material added to the slurry or raw materials, during or after grinding, such as grinding aids or deflocculants, or to the kiln feed to change the burning characteristics of the raw mix or increase alkali volatilization.

AGITATION
The mixing and homogenization of slurries or finely ground powders by air or mechanical means.

AGITATOR
A rake or paddle, often with jets for compressed air, to mix or maintain suspensions in slurries.

AIR-COOLED JACKET
Jacket around a burner pipe, open at both ends, to allow cool outside air to be drawn along the outside of the burner tip by the fuel or air-fuel mixture as it leaves the tip.

AIR DEFICIENCY
The lack of sufficient oxygen to allow complete combustion of the fuel in the kiln. Results in combustibles in the waste gases.

AIR-ENTRAINING CEMENT
Cement into which has been interground a small amount of an air-entraining agent such as certain rosins, resins, or fatty acids. During the mixing of concrete or mortar, the use of air-entraining ce-

ment produces air-entrained concrete or mortar.

AIR LIFT
Elevating equipment whereby slurry or dry powder is conveyed upwards through pipes by means of compressed air.

AIR-PERMEABILITY TEST
A measurement of the fineness of portland cement or any finely divided powder; expressed as surface area in square centimeters per gram.

AIR-QUENCHING COOLER
Cooler in which the hot clinker passes over grates with cold air forced up through the load for rapid cooling.

AIR SEPARATOR
An upright cylindrical-conical apparatus, with internal rotating blades, which separates various sized fractions of ground materials by centrifugal force. Fine particles are discharged as product; oversize is returned to the mill as tailings.

AIRSLIDE (trade name)
Enclosed conveyor in which finely ground materials are transported by gravity over a slightly inclined porous fabric. Air supplied below the fabric keeps the powdered material fluid.

AIR-SWEPT MILL
A ball or tube mill in which the finely ground particles are removed by a stream of air passing through the mill.

ALKALI
A substance having marked basic properties—generally sodium or potassium oxides or hydroxides. (see also LOW-ALKALI CEMENT)

ALUMINA
Aluminum oxide—Al_2O_3.

ALUMINA REFRACTORY
Brick composed essentially of alumina and silica, with the alumina in proportions ranging between 40 and 70 percent.

ALUMINOUS CEMENT
(Trade names: "Ciment Fondu," "Lumnite," and others) Consists essentially of monocalcium aluminate ($CaO\text{-}Al_2O_3$) and is made from such raw materials as bauxite and limestone, heated to complete fusion. Has high-early strength and refractory properties.

ANGLE OF REPOSE
The angle between the horizontal and the natural slope of loose material (such as cement), below which the material will not slide.

ANHYDRITE
Anhydrous calcium sulphate—$CaSO_4$. Gypsum from which the water of crystallization has been removed, usually by heating above 325 deg. F. Natural anhydrite is less reactive than that obtained at 325 deg. F.

ANION
A negative ion; a negatively charged atom or group of atoms. It is attracted to the anode during electrolysis.

ANTHRACITE
A hard, natural coal which contains approximately 85-95 percent carbon and a low percentage of volatile matter.

APRON FEEDER
(see PAN FEEDER)

ARC SPECTROGRAPHY
Spectrographic identification of elements in a sample of material, heated to volatilization in an electric arc or spark.

ARENACEOUS
Composed largely of sand.

ARGILLACEOUS
Composed primarily of clay or shale.

ASH
The inorganic residue remaining after the combustion of a fuel.

ASH RING
Kiln ring near the discharge end promoted by the fallout of ash particles on the load or lining.

ATTRITION
(1) Wear and tear. (2) Grinding in which size reduction is accomplished by rubbing or friction.

AUGER
A boring tool, particularly for drilling rock.

AUTOCLAVE
High-temperature, steam pressure container for laboratory testing of volume stability of concrete, neat cement or mortar specimens.

AUTOGENOUS GRINDING
Grinding with few or no grinding media in relatively large-diameter, short mills where the cascading load produces the impact.

AUTOMATION
Use of self-regulating production or processing machinery actuated by "feed-back" or by COMPUTERS.

AUXILIARY KILN DRIVE
Stationary reserve engine, usually diesel or gasoline, to be connected to kiln drive in case of power failure, to prevent warping of the shell.

B

BACKSPILL
The material which spills out of the feed end of the kiln when the flow of slurry is obstructed by chains or mud rings.

BAG-TYPE DUST COLLECTOR
Collector in which dust is trapped when dust-laden air is passed through porous bags.

BALL COATING
Reconsolidation of finely ground, dry material on the surface of the grinding media which inhibits further comminution.

BALL MILL
Horizontal, cylindrical, rotating mill charged with large grinding balls and having a diameter approximately equal to the length.

BALL-AND-RACE MILL
Vertical grinding mill for dry raw materials, coal or clinker. The material is ground by steel balls (8 in. to 12 in. diameter) rotating horizontally in a race.

BARREL
(1) Weight measure for portland cement corresponding to 4 bags of 94 lb. each. One American barrel of cement is 376 lb. net (Canadian 350). Most other countries use a ton of (a) 2,000 lb. (20 bags @100 lb.), or (b) 1,000 kilos (20 bags @ 50 kg.). (2) Wood or metal container formerly used for shipping cement.

BASIC REFRACTORY
Kiln lining made from magnesite or chrome ore. These bricks exhibit greater refractoriness and better resistance to chemical attack by slags and metallic oxides than the alumina or silica types.

BATHTUB ZONE
That zone of a kiln (the calcining or burning section) which is of greater diameter than the remainder of the kiln.

BAUXITE
Raw material composed primarily of $Al_2O_3 \cdot 2H_2O$ together with quantities of SiO_2 and Fe_2O_3.

BELT CONVEYOR
Conveyor by which dry materials are transported on a continuous flat or slightly curved belt of rubber and/or fabric traveling over rollers.

BENEFICIATION
Improvement of the chemical or

physical properties of a raw material or intermediate product by the removal of undesirable components or impurities.

BIN-DICATOR (trade name)
A bin level indicator which may be installed at various points in bins, silos, hoppers, chutes and conveyor boxes. Each unit is equipped with a diaphragm and counterweight suited to the material in the bin.

BIN SYSTEM
(Coal grinding and firing)
Arrangement incorporating a system of bins for pulverized coal from which it is fed to the stream of primary air and carried into the kiln. Not used with DIRECT FIRING (cf.).

BITUMINOUS COAL
Soft coal which contains 50 to 80 percent carbon and which when heated yields considerable volatile matter.

BLAINE APPARATUS
Air permeability apparatus for measuring the surface area of a finely ground cement, raw material, or other product.

BLASTING
Removing rock from a quarry wall by means of explosives. Explosives are deposited in holes drilled in the rock and spaced to produce fragmentation.

BLEEDING
The accumulation of water on the surface of a mortar or concrete caused by the settlement of the solid materials within the mass.

BLENDING
Combining the contents of two or more bins, tanks or silos of raw materials or cement to adjust the analysis of the final product.

BLENDING BIN
A bin into which the contents of two or more bins are pumped for blending.

BLINDING
The filling or plugging of the openings in a screen by the material being separated.

BLOCK CAVING
A method of mining material from the top down in thick successive layers or blocks. Each block is undercut over the greater part of its bottom area and the supporting pillars blasted out. As the block caves and settles, the cover over the block follows. The valuable material is removed through crosscuts and shafts.

BOWL CLASSIFIER
Equipment for separating coarse and fine particles in cement raw material slurry, ground with surplus water.

BOWL MILL
Vertical grinding mill in which materials are ground between centrally suspended rollers and a revolving annular ring.

BOX TIRE (see TIRE)

BRADLEY MILL (trade name)
(see ROLLER MILL)

BREAKER PLATE
Heavy, wear-resistant liners for JAW CRUSHERS or ROLL CRUSHERS.

BRIDGE CRANE
A crane which travels on widely separated rails, usually above a storage area.

BRIQUETTE
A molded specimen of mortar with enlarged extremities and a center cross section of one square inch, used for measurement of tensile strength.

BRITISH THERMAL UNIT (BTU)
The amount of heat required to raise the temperature of one pound of water 1 deg. F. at or near its point of maximum density.

BULK LOADING
Loading of unbagged cement in containers, specially designed trucks, railroad cars or ships.

BURN, BURNING
(1) Combustion of fuel. (2) Sintering or near-fusion in a kiln, resulting in chemical combination of the raw materials and formation of clinker.

BURNABILITY
The ability of raw materials to react chemically on heating. Softer and more finely ground and intimately mixed raw materials of the proper chemical content combine into cement clinker more readily. Relatively high contents of iron and alumina facilitate burning (through fluxing action), whereas silica has the opposite effect.

BURNER (or BURNER MAN)
The operator who controls the burning process of a cement kiln by making changes in fuel, feed rate, kiln speed, draft, etc., so as to produce a quality clinker at the highest possible rate, with minimum consumption of fuel and proper conservation of equipment.

BURNER GLASSES
Special glasses for viewing the burning operation in a kiln. Blue or green glasses containing cobalt or iron stop the passage of infrared rays.

BURNER PIPE
The pipe through which the fuel (coal, oil, or gas), and usually part of the combustion air, is blown into the kiln.

BURNER'S PLATFORM
The platform or floor at the lower end of the kiln on which are located controls, and where the burner regulates the operation.

BURNING ZONE
The zone near the discharge end of the kiln in which the dried and calcined raw materials are chemically converted to portland cement clinker at temperatures near 2800 deg. F.

BUSHY FLAME
(see TURBULENT FLAME)

BUTTSTRAP
Steel band for riveted joints in kilns or mills.

B. & W. MILL (trade name)
(see BALL AND RACE MILL)

C

CALCAREOUS
Composed primarily of calcium carbonate.

CALCINATOR
Machine for drying and preheating slurry through intimate contact with hot kiln exit gases, passing in counterflow through a vessel charged with heat-exchanging elements. Normally little if any calcination (liberation of CO_2) takes place.

CALCINING ZONE
That zone in the kiln where calcium carbonate is decomposed into CaO and CO_2 at temperatures near 1600 deg. F.

CALIBRATE
To determine and correct for error in the readings of a measuring device.

CALIBRATION TANK
Small tank equipped with float or electronic probe, and electrically remote-controlled by kiln-operator, located between kiln feeder and feed pipe. In the automatic measuring cycle the time of filling the tank is recorded on a stop

watch on the control panel. Tables for various water content provide actual kiln feed rate (solids) with 0.1% accuracy.

CALORIE
A unit of heat: (1) the amount of heat required to raise the temperature of one gram of water 1 deg. C. (2) in food and fuel values (heat consumption in kiln): the amount of heat required to raise the temperature of one kilogram of water 1 deg. C. (called a "large" calorie, being 1000 times the "small" calorie).

CALORIMETER
An instrument for measuring heat, such as the quantities of heat liberated by the combustion of a fuel. In cement laboratories a fuel is burned in a "bomb," suspended in a volume of water, and the heat given off during the combustion of the fuel is calculated from the resulting increase in the temperature of the water.

CAPACITY
(1) Rated—The maximum production predicted from the equipment dimensions, characteristics and performance. Annual rated capacity of kilns and entire plants usually determined as total production during best three continuous months, divided by the number of days, multiplied by 365. (2) Actual—The annual production attainable under normal operating conditions, usually about 90 percent of rated capacity.

CARBON
A chemical element forming a constituent of coal, petroleum, limestone and other carbonates.

CAR TIP
A hoisting mechanism used to raise one side or one end of a specially designed railroad car or truck, or its body, to dump the contents.

CASCADING
The rolling and falling motion of grinding balls in a mill, or of clinker in a kiln, as the equipment rotates. In mills, particularly, the movements of grinding media in a trajectory from a position near the top to the point of impact at the bottom.

CASTABLE REFRACTORY
Refractory material which is made into a paste or slurry and placed to form a MONOLITHIC lining.

CATION
A positive ion; a positively charged particle, atom or group of atoms. During electrolysis the cations travel towards the cathode or negatively charged electrode.

CEMENT
Any chemical binder, such as glue, paste, etc., used to make bodies adhere to each other. (see PORTLAND CEMENT)

CEMENT COOLER
Equipment for cooling finished cement after grinding. May consist of water-jacketed screw conveyor with water-cooled impeller shaft and blades, or a vertical cylinder, with the outside cooled by running water and along the inner surface of which a thin layer of cement is moved by centrifugal action.

CEMENT PAINT
A combination of cement (usually white) and hydrated lime along with water repellents, pigments and accelerators, which may be mixed with water for application, usually to concrete surfaces.

CEMENT ROCK
Natural, impure limestone which contains the ingredients for cement in approximately the required proportions.

CEMENTITIOUS
Sticky, adhesive.

CENTRALIZED CONTROL
Arrangement of indicating, recording, and regulating instruments in a central place (panel, console) in each operating department or in one room for the entire plant.

CENTRICLONE (trade name)
(see LIQUID—SOLID—CYCLONE)

CENTRIFUGAL PUMP
A pump in which a rotating impeller inside a housing gives motion to a fluid or suspension through centrifugal force. Used especially for slurry.

CENTRIFUGE
Equipment used to reduce the moisture content of a slurry or suspension by means of rotation, with resulting centrifugal force. Functions essentially as a THICKENER but with the force of gravity increased many times.

CHAIN BALANCE
A laboratory balance or scale in which small changes in weight on one side of the balance are achieved by lengthening or shortening a small chain attached to one balance arm.

CHAIN SYSTEM
A system of chains suspended in the feed end of a kiln to promote heat transfer to the raw mix.

CHALK
A soft limestone composed chiefly of the shells of small marine life.

CHARGE
The amount of grinding media in a ball- or tube-mill.

CHECK POT
(see CALIBRATION TANK)

CHERT
An impure, flintlike rock, consisting mainly of silica (SiO_2).

CHOKE
To make changes in a flame by reducing the velocity or percentage of primary air. A choke in a fuel pipe might be a constriction which would reduce the nozzle velocity of the air-fuel mixture and usually the flame length.

CHURN DRILL
Quarry drill for primary blast holes. Consists of a weight which is hoisted up and down in the drill hole and with an auger attached to its underside, so shaped that it makes a fraction of a turn every time it strikes the bottom.

CHUTE
An inclined trough down which fluids or solids may flow or slide to a lower level by gravity.

CIRCULATING LOAD
The proportion of separator tailings to new mill feed. Often stated in percent.

CLAMSHELL BUCKET
The bucket on a quarry shovel or storage crane which opens as a clamshell to pick up a load.

CLAY
An earthy, plastic material high in silica, alumina, and iron.

CLAY SLIP
A suspension of clay in water prepared for ease of handling and proportioning.

CLINKER
The fused product of a kiln which is ground to make cement.

CLINKER BREAKER
A series of hammers or rollers installed at the discharge end of a clinker cooler, to break lumps for more rapid cooling.

CLINKER-CEMENT BRICKS
Refractory bricks for rotary kilns made in cement plants from

screened clinker, portland cement and very little water, tamped by hand or machinery, stocked, watered, and air-cured. No chemical reaction will take place in kilns between such bricks and the load.

CLINKER CONVEYOR
Any drag chain, bucket, belt, pan or vibrating conveyor used to move clinker from the burning department or storage.

CLINKER COOLER
Equipment used to cool clinker by motion or air. Includes drag chain, air-quenching, rotary, planetary, inclined grate, vibrating.

CLINKER CRUSHER
(1) (see CLINKER BREAKER) (2) Separate jaw or roll-crusher for clinker installed ahead of grinding mills.

CLINKER MILL
(see FINISH MILL)

CLINKER RING
A buildup in or near the back of the burning zone of a kiln in which melted or fused raw materials have adhered to the kiln lining in excessive amounts.

CLINKER SCALE
Mechanical or nuclear scale providing a continuous record of weight of clinker produced, such as leaving clinker cooler.

CLINKER STORAGE
The area (covered or exposed to the elements) or silos in a cement plant where clinker is stored or aged before grinding.

CLOSED-CIRCUIT GRINDING
Grinding system in which mill product is passed to a screen or separator so that fines may be removed from the circuit and oversize (tailings, sands) returned for further grinding.

CLOSED-CIRCUIT TV
Cameras and monitors connected by wires without use of antennas.

COAL STORAGE
The storage area (often in the same building or location as clinker and raw material storage) where stocks of coal are maintained.

COATING
(1) Crust of raw mix, clinker, and ash deliberately formed and maintained in the burning zone of a rotary kiln for protection of the lining.
(2) (see also BALL COATING)

COLLOID
Any substance in a certain state of fine division in which the particles range in diameter from about 0.2 to about 0.005 micron.

COMMINUTION
Progressive reduction in size by crushing, grinding or pulverizing.

COMPARATOR
An instrument used for measuring changes in length of test specimens.

COMPARTMENT MILL
Tube mill in which division heads or partitions are used to divide the mill into two or more compartments charged with varying sized media.

COMPEB MILL (trade name)
A compound or compartment mill in which the preliminary compartment is charged with larger media, or rods (Rodpeb-mill), so that it takes the place of a separate ball mill. Made up to 13 by 52 ft. in size, pulled by motors up to 6,600 hp.

COMPOUND
Chemical substance composed of or produced by the union of several elements. The four major potential compounds of portland cement are tricalcium silicate, dicalcium silicate, tricalcium aluminate and tetracalcium aluminoferrite.

COMPUTER
(Data processing system) Aggregate of electronic instruments to which information may be fed (input) and processed through previously programmed instructions for arithmetical procedures, and which delivers the results of these calculations (output).
Analog computers translate mathematical equations into physical (electric) quantities for solution of the problems, similar to a slide rule. In *digital computers* the mathematical quantities are represented by symbols or counters, similar to desk calculators or abaci.
Business computers accept programs and input from human operators and produce solutions to problems of cost accounting, orders, shipments, billing, inventory, warehousing, payroll, and preventive maintenance.
Process computers (production line control) receive input of process variables from sensing instruments and, based on mathematical studies, actuate control devices to produce or maintain intended temperature, load, pressure, draft, flow, speed, composition, fineness, etc. Intended benefits include stable operation, increased production, improved efficiency, labor economy, improved uniformity, complete operating records, and alarm for off limits.

CONCAVEX
Grinding balls characterized by surface indentations which produce both concave and convex areas in the surface.

CONDUCTION
Transmission of heat through a body without motion of the body as a whole.

CONE CRUSHER
(see GYRATORY CRUSHER)

CONICAL MILL
(see HARDINGE MILL)

CONSISTENCY
The fluidity of mortar or slurry (closely related to workability) measured by its flow, or of concrete measured by its slump.

CONSTANT HEAD FEEDER
A raw mix or slurry feeder equipped with supply tank and overflow to assure a constant pressure at the discharge pipe.

CONSTANT WEIGHT FEEDER
(see WEIGHING FEEDER)

CONSTRICTION
A narrowing of the free path of flow such as a dam in a kiln.

CONTINUWEIGH (trade name)
(see WEIGHING FEEDER)

CONVECTION
Transfer of heat by currents in a gas or liquid resulting from differences in density.

CONVEY-O-WEIGH (trade name)
(see WEIGHING FEEDER)

COOLER FAN
Large, rotating fan used to force air through a clinker cooler.

COOLING HISTORY
Successive time and temperature intervals through which clinker passes after burning zone in kiln. Cooling history has important influence on crystallographic and grinding properties.

COQUINA SHELLS
½- to ¾-in. sea shells found along present or former salt-water shore lines. Used as calcareous raw material.

COULTER COUNTER
Laboratory apparatus for determination of number and size of particles suspended in liquid and passing through an aperture in an electrically conductive system.

COUNTERFLOW
Process arrangement whereby a fluid (gas, water) travels in contact with, but in opposite direction to, a material (clinker, slurry, raw meal) for exchange of heat or concentration.

CRADLE FEEDER
Raw material feeder for grinding mill consisting of a chute, at the foot of a bin, through which the flow of crushed rock is maintained and controlled by the rocking motion of a curved plate.

CROSS SYSTEM
A system of segments or crosses of steel or refractory material in the upper end of a kiln and at right angles to the axis. Aids in heat transfer by increasing the surface area exposed.

CURTAIN CHAINS
Chains suspended in the feed end of the kiln in lengths approximately ¾ of the kiln diameter and with only one end of each length attached.

CYCLING
The alternate surging of load in a kiln resulting in excesses and deficiencies of heat for proper burning.

CYCLONE
Conical sheet steel vessel for separation of solids from fluids (air or water) by centrifugal action.

CYLPEBS (trade name)
("Cylindrical pebbles") Cast or clipped cylindrical grinding media for tube mills, approximately ½ in. in diameter and 1 in. long.

D

DAM
(see CLINKER RING and MUD RING)

DAMPER
A valve, plate, or set of adjustable louvres in a flue used to regulate the draft.

DATA LOGGING
Scanning and recording (typeout or memory tapes), at regular intervals, of process data (temperatures, drafts, weights, speeds, analyses, etc.), preparatory to adoption of COMPUTER control.

DEAD BURNED GYPSUM
$CaSO_4$ (see ANHYDRITE).

DEFLOCCULATION
The dispersion of flocs or agglomerated particles of finely ground materials. (cf. SLURRY THINNERS).

DIAPHRAGM
Partition, such as used to separate chambers in compartment mills.

DICALCIUM SILICATE
One of the four potential compounds in portland cement: "C_2S" $=(CaO)_2SiO_2=Ca_2SiO_4$. Contributes to high ultimate strength.

DIFFERENTIAL THERMAL ANALYSIS
(DTA) Indication of chemical reaction by diffential thermocouple recording of temperature increases in sample under investigation compared with a thermally passive control sample, heated uniformly and simultaneously.

DIFFUSION FLAME
(see LAMINAR FLAME)

DIRECT FIRING
Blowing powdered coal directly into kiln from a UNIT PULVERIZER without BIN SYSTEM.

"DIRTY" TAILINGS
Rejects from separators containing quantities of fines suitable for the finished product.

DISK FEEDER
A rotating disk or table upon which feed is continously deposited through a telescope pipe and which is equipped with an adjustable knife edge to divert a determined amount of feed into a mill.

DISPERSANT
A material which deflocculates or disperses finely ground materials by satisfying the surface energy requirements of the particles. Used as a SLURRY THINNER or GRINDING AID (cf.).

DOLOMITE
A limestone or marble rich in magnesium carbonate. Must be limited in raw materials for cement manufacture.

DORRCLONE (trade name)
(see LIQUID—SOLID—CYCLONE)

DRAFT GAUGE
Usually a manometer for measuring the static pressure of the gases passing through a flue.

DRAG CHAIN COOLER
A ladder-shaped chain approximately 1 to 1½ ft. in width used to convey and cool clinker by agitating it so that new surfaces are constantly exposed.

DROP BALL ("Skull cracker")
A heavy weight which is raised by a crane and dropped on large pieces of rock in the quarry for crushing, to eliminate the need for secondary blasting.

DROP-OUT BIN
Dust housing (dust chamber) at feed end of rotary kiln, for collection of coarsest dust particles in kiln exhaust.

DROSS
Slag, skimmed from smelting of metals such as tin and aluminum. Occasionally used as a cement raw material.

DRYING ZONE
That zone near the feed end of the kiln, in which the moisture in the load evaporates, usually at temperatures between 400-1200 deg. F.

DRY PROCESS
Process for cement manufacture in which the raw materials are ground, conveyed, blended and stored in a dry form.

DUCT
An enclosed passage or pipe for the flow of gases or fluids.

DUMBBELL KILN
A kiln in which the center section is of a lesser diameter than the ends.

DUST CHAMBER
The chamber or housing at the feed end of a kiln where coarse dust is trapped or deposited through changes in gas velocity.

DYNACLONE (trade name)
(see BAG TYPE DUST COLLECTOR)

E

ECONOMIZER
Chamber beyond the waste heat boilers in which further heat recovery is attained by using the heat from exhaust gases at temperatures of 400-600 deg. F. to heat feed water for the boilers.

ELECTRIC EAR
(see ACOUSTIC MILL FEED CONTROL)

ELECTROSTATIC DUST PRECIPITATOR
Collector for fine dust, particularly in kiln gases. Dust laden air is passed through a large cham-

ber where the dust particles are ionized by contact with chains or rods connected to one pole of a high-voltage rectifier, and then attracted to and collected on the sides of tubes or collector plates connected to the other (grounded) pole. Collectors are rapped periodically to discharge dust.

ELEVATOR
Roller chain on which are attached heavy steel buckets which carry loads to higher elevations. Usually driven by a pair of toothed sprockets at the head end and equipped with automatic brakes to prevent reversal if the drive breaks down.

ELUTRIATION
Purification by washing and straining or decantation. Air elutriation represents separation or purification by removing particle sizes or forms with varying densities through the use of air pressure. (The reverse of sedimentation.)

ENDOTHERMIC
Chemical reaction requiring the continued absorption of heat such as the calcination or decomposition of limestone.

EROSION
Formation of gullies and ridges in the coating or lining of a kiln near the nose, from direct exposure to intense heat of the flame.

EVAPORATING ZONE
(see DRYING ZONE)

EXCESS AIR
That proportion of the air entering the kiln which takes no part in the burning process and passes from the kiln with the waste gases.

EXOTHERMIC
Chemical reaction in which heat is given off after the action commences. Examples: hydration of cement, and clinkering in the burning zone in kilns.

EXPANSIVE CEMENT
Cement made to expand for compensation of shrinkage or to induce tensile stress in reinforcing steel (post-tensioning). May be made as a mixture of (a) portland cement, aluminous cement, and gypsum, or (b) portland cement, a stabilizer, and an expansive agent produced by burning of gypsum, bauxite, and chalk. Both methods are believed to result in the formation of hydrated or anhydrous calcium sulfoaluminates in the paste.

F

FALSE SET
A manifestation of an abnormal early hydration reaction in which rigidity or partial setting of the paste occurs in a few minutes. When the stiffened paste is remixed even without the further addition of water it resumes its plasticity and no loss of strength occurs.

FEED-BACK CONTROL
Adjustments of feed, speed, and other process components, based on analyses of subsequent product samples.

FEEDOWEIGHT (trade name)
(see WEIGHING FEEDER)

FEED PIPE
The pipe through which the feed material to a mill, kiln or tank is conveyed.

FEED SYNCHRONIZATION
Adjusting the speed of a feeder to correspond to changes in kiln speed through automatic electrical or mechanical devices.

FELDSPAR
Any of a group of crystalline minerals composed primarily of aluminum silicates.

FERRIFEROUS
Composed largely of iron materials.

FERRIS WHEEL
Feeder with cups or buckets which pick up and move products in the manner of a ferris wheel.

FESTOON
(see LOOP CHAIN)

FIELD JOINTS
Joints in kilns where the prefabricated sections are assembled on site by means of welding or butt-straps.

FILTER AID
Chemical added to slurry to facilitate filtration.

FILTER CAKE
Slurry remaining on the filter cloth after water has been removed, with the residual moisture being approximately 40-50 percent of the original.

FILTRATE
The fluid which passes through a filter.

FINES
(see SEPARATOR FINES)

FINISH DEPARTMENT
The department in a cement plant where clinker is ground into cement.

FINISH GRINDING
The grinding of clinker into finished cement usually with the addition of 3 to 6 percent gypsum.

FINISH MILL
(1) Usually a tube mill in which the final stages of clinker grinding are accomplished. (2) The entire finish grinding department.

FLAME PHOTOMETER
An instrument used to determine elements (sodium and potassium in portland cement) by the color intensity of their unique flame spectra resulting from introducing a solution of a compound of the element into a flame.

FLAME PROPAGATION
Passing of a flame through an air-fuel mixture. Excessively high fuel-stream velocities may result in unstable ignition; low fuel-stream velocities, less than the speed of propagation, often result in backfiring.

FLAME VELOCITY
(see NOZZLE VELOCITY)

FLASH SET
(see QUICK SET)

FLINT PEBBLES
Hard pebbles of approximately spherical shape formerly used in ball and tube mills as grinding media.

FLOATING TIRE
A KILN TIRE (cf.) slightly larger than, and not fastened to, the kiln; held in position by alternate projections on supporting shoes between it and kiln shell and being free to rotate.

FLOCCULATION
Accumulation or agglomeration of fine particles into masses or flocs.

FLOTATION
Beneficiation of raw material slurry by means of surface active agents, agitation, and introduction of compressed air as fine bubbles. Depending on the agent used, impurities such as carbon or excess of silica, alumina or iron are carried to the surface as a foam which is skimmed off. Used for beneficiation in some cement plants where correct mix cannot be obtained by blending of available raw materials.

FLOUR
That part of the ground raw materials or cement of exceeding fineness, generally 25 to 30 microns or smaller in size.

FLOW TABLE
Laboratory instrument used in making flow tests for consistency

of mortars or concretes in tests of hydraulic cement.

FLOW TROUGH (BURMISTER)
Laboratory instrument used to measure consistency of mortar to be used for measurement of air content. No longer included in specifications.

FLUE
(see DUCT)

FLUE DUST
Clinker or raw-material dust trapped in flues or pipes because of changes in gas temperature, velocity, or direction.

FLUIDIZATION
Aeration of dry powder to make it behave as a fluid.

FLUX
A material used to promote fusion or melting.

FLUXO PUMP (trade name)
Pneumatic conveyor for dry powders, such as cement, consisting of a pressure tank in which the cement is aerated and a transport pipe through which the material is forced by compressed air only.

FLY ASH
Residue of fused spherically shaped particles from burning of powdered coal. Available from power plants using DIRECT FIRING coal mills. May be used (1) as an argillaceous-siliceous component of cement raw mix; and (2) as an addition to concrete, depending on carbon content and uniformity.

FORWARD CONTROL
Calculation of mix proportions based on analyses of raw material samples.

FOXHOLE
(see TUNNEL)

FREE LIME
CaO in clinker and cement which has not combined with SiO_2, Al_2O_3 or Fe_2O_3 during the burning process, usually because of underburning, insufficient grinding of the raw mix, or the presence of traces of inhibitors.

FRIABLE
Easily crumbled or pulverized.

FULLER COOLER (trade name)
(see INCLINED GRATE COOLER)

FULLER-KINYON PUMP (trade name)
A pneumatic conveyor for pulverized materials which embodies a specially designed worm or screw revolving in a closed chamber. Compressed air is introduced at the discharge end of the conveyor so that the mass becomes aerated and semi-fluid, in which state it is carried to its destination through a transport pipe line.

FUSION
Act of melting together.

G

GAMMA RADIATION GAUGE
Radioactive sender and receiving units located at opposite sides of slurry pipe for measuring, indicating, recording, and controlling moisture content.

GANG MOLD
A mold for cubes, bars, or briquettes in which two or more are made or cast at a time.

GAS ANALYZER
An instrument using the principle of chemical combination or catalytic combustion in which a sample of gas may be collected and analyzed for oxygen, carbon dioxide and combustible materials. (see also ORSAT)

GEL
A jellylike material. Particularly the cementitious matrix ("paste") formed by the hydration of cement particles in concrete or mortar.

GILLMORE NEEDLES
A pair of weighted, flat-ended needles of different cross section for determing initial and final setting times of hydraulic cements.

GLORYHOLE SYSTEM
A method of mining using a system of haulageways beneath the block of material which has had its top surface exposed by the removal of overburden. Connecting with the haulageways are chutes that extend up to the surface. The excavation of the material begins at the top of the chute, and the broken ore is removed by loading it out from the chutes into cars on the haulage level. The material is worked from the top down.

GRAB SET
(see FALSE SET)

GRANITE
A very hard natural rock, consisting essentially of quartz, feldspar, and mica.

GRAVIMETRIC ANALYSIS
Quantitative chemical analysis based on weight of samples, residues, precipitates, etc.

GRIFFIN MILL (trade name)
(see ROLLER MILL)

GRINDABILITY
The response of a material to grinding effort. Can be measured in a number of ways. A current grindability test measures it in grams of product material produced per revolution of a test mill. The more grams produced per revolution, the easier a material is to grind and the higher is the grindability.

GRINDING AIDS
Certain chemical additives which aid in tube mill grinding by reducing ball coating or by dispersing the finely ground product.

GRINDING BALLS
(see GRINDING MEDIA)

GRINDING MEDIA
Hard, free-moving charge in a ball or tube mill between which particles of raw material, coal, or clinker are reduced in size by attrition or impact. Usually of steel, and spherical in shape with graded sizes, the maximum in a ball mill being about 3 to 4 times the maximum feed size.

GRIZZLY
Screen for large rocks made of heavy steel bars or rails.

GYPSUM
$CaSO_4 \cdot 2H_2O$—Hydrated calcium sulphate added to portland cement clinker and interground in the ratio of about 3 to 6 percent to control the setting time of the cement paste.

GYRATORY CRUSHER
A crusher for rock or clinker in which a steel center cone rotates eccentrically to crush the material against the outside cylindrical or conical steel wall.

H

HAMMER MILL
Secondary crusher in which rapidly rotating bars or hammers pass between grates to crush material by impact. The tolerance between hammers and grate usually is 1 inch or less.

HARDINGE MILL (trade name)
A conical ball mill with a graded charge, designed so that larger balls will segregate in that portion of the mill where the cone has the largest diameter.

HEAT BALANCE
A method of accounting for all the heat units supplied, trans-

ferred, utilized in, and lost from a kiln.

HEAT EXCHANGER
Equipment such as chains, quadrants, lifters, etc., which facilitates the transfer of heat from the gases to the load in a kiln or preheater.

HEAT OF HYDRATION
The heat given off by cement paste during the chemical combination of cement with water. An exothermic process.

HEAT VALUE
Heat value of a solid fuel is expressed in B.t.u.'s per pound of fuel on as-received, dry, or moisture-and-ash free basis. Heat values for gases, in B.t.u.'s per 1000 cu. ft., and for liquid fuels, in B.t.u.'s per gallon, are usually computed by adding together the heat contributed by the constituent gases or hydrocarbons.

HELICAL CHAIN
Each chain length in a CHAIN SYSTEM is advanced along the kiln shell longitudinally as well as circumferentially. The total curtain is in the form of a spiral along the shell.

HEMATITE
An important ore of iron, Fe_2O_3, red when powdered.

HEMIHYDRATE
A hydrate which contains one-half a molecule of water to one molecule of the compound. In cement, $Ca\,SO_4 \cdot \frac{1}{2}H_2O$ (partially dehydrated gypsum, or Plaster of Paris) is most commonly known.

HERCULES MILL (trade name)
(see ROLLER MILL)

HIGH-EARLY-STRENGTH CEMENT
Cement (Type III) characterized by producing earlier strength in mortar or concrete than regular cement.

HIGH LIME ROCK
Limestone which contains approximately 75 percent or more of calcium carbonate.

HOLDING POINT
The value selected as a basis for controlling raw material proportions, usually depending on the carbonate reading of the raw mix.

HOMOGENIZER
A bin or tank in which fluids or powders are thoroughly mixed and blended by compressed air, paddles or rakes.

HOPPER
A receiver or receptacle with bottom discharge in which substances are placed to be passed or fed to a mill.

HOT SPOT
An exterior area of the kiln shell, usually in the burning zone, which becomes heated to a temperature sufficient to cause the shell to be red hot or to glow. Usually caused by the loss of coating or lining.

HUM-MER SCREEN (trade name)
Screening device for separating materials in which electric vibration is applied to a taut screening surface.

HYDRATION
Chemical combination of cement with water.

HYDRAULIC CEMENT
Cement capable of setting under water.

I

IGNITION LOSS
The percentage loss in weight when an as-received sample is ignited to constant weight at 900-1000 deg. C. for short periods of time.

IMPACTOR (trade name)
Large HAMMER MILL

IMPINGE
To strike directly upon (as a flame may impinge on the load in a kiln).

INCLINED GRATE COOLER
An enclosed, inclined system of moving grates. Clinker dropped on the high end moves progressively to the lower, discharge end while cool air is forced through the grates and load from below.

INDICATOR
An automatic apparatus which shows, by the position of a pointer or level of a liquid, the temperature, speed, or level of equipment or process.

INDUCED DRAFT
Flow of gases through the kiln created by a suction fan.

INFRARED SPECTROSCOPY –
Use of spectrophotometer for determination of infrared absorption spectra (2.5 to 18 micron wave lengths) of materials. Used for detection, determination, and identification of organic materials and the reaction between organic admixture and concrete components.

INSOLUBLE RESIDUE
The material remaining after cement is treated successively with hydrochloric acid and sodium hydroxide solutions of specific concentrations for designated periods of time.

INSUFFLATION
Practice of adding dust to the coal in a burner pipe.

INSULATING REFRACTORY
A good grade of refractory fireclay brick with a large percentage of open pore space. This open pore space may be about 70-75 percent as compared to approximately 20 percent for high-duty fireclay brick.

INTERLOCKING
Interconnecting of electrical controls to assure that a series of motors can be started only in the correct sequence, or that they are all disconnected at the same time to prevent congestion of material in conveyors and process equipment.

INTERSTICE BIN
A bin formed by the exterior walls of three or more silos or bins, so placed as to enclose the adjacent space on all sides.

ION
An electrically charged particle, atom, or group of atoms.

IRON-ALUMINA RATIO
$\frac{Fe_2O_3}{Al_2O_3}$ Varies from plant to plant, depending on raw materials and type of cement being produced. At some plants the reciprocal is used for control.

J

JACKHAMMER
A rock drill operated by compressed air.

JAW CRUSHER
Crusher consisting of two plates, farther apart at top than at bottom, one movable and one stationary. The movable plate which is attached at the upper end, is given a reciprocating motion by means of an eccentrically operated arm. Feed is crushed as it passes down between the two plates.

DATA LOG

AUTOGENOUS

NUCLEAR

SPECTROPHOTOMETER

PROGRAMMING

TV

DTA

EXPANSIVE CEMENT

COMPUTER

XRD

CEMENT PLANT GLOSSARY

PART II

K

KAOLIN
White-colored clay, principally aluminum silicate, of low iron content, used as raw material in the manufacture of white cement.

KILN
Piece of equipment in which the properly ground and proportioned raw mix is dried, calcined, and burned into clinker at a temperature of 2600 to 3000° F. Can be of the rotary, shaft, fluid-bed, or traveling grate type; fuel may be coal, oil or gas.

KILN BASIN
(see SLURRY BASIN)

KILN BEDDING
The degree of filling by the load in a rotary kiln, normally 3 to 10 percent of the free cross section.

KILN DEPARTMENT
The department of a cement plant which includes the kilns with all auxiliaries (feeders, drives, coolers, dust collectors, burner's platform, fans, dampers, and fuel injection device).

KILN GUN
Special industrial 8-gauge gun used for shooting down clinker rings or for breaking up large clinker balls in rotary kilns. Lead or zinc pellets may be fired. The kiln gun is sometimes used for scaling in quarries or mines.

KILN HOOD
Refractory-lined steel plate housing around discharge end of rotary kiln, furnished with openings for fuel pipe, radiation pyrometers, observation openings, and cleanout doors.

KILN INCLINATION
The lengthwise slope in a vertical plane of a rotary kiln from feed end to discharge end; usually stated in inches per foot (e.g. ½ in. per ft.), less frequently in percent (such as 4 percent).

KILN INSULATION
Material, such as diatomaceous earth, placed between kiln shell and refractory lining to minimize heat loss.

KILN LINING
A layer of refractories, 6 in. to 9 in. thick, placed inside a rotary kiln to protect the steel shell against heat and abrasion.

KILN PAINT
Heat-resistant paint sometimes applied to outside of rotary kilns for protection, and to reduce heat loss.

KILN PIER
Concrete or steel support for rotary kiln, one pier located under each set of supporting rollers for the kiln tires.

KILN PITCH
(see KILN INCLINATION).

KILN QUADRANT
Cross-plates installed in the feed end of a rotary kiln to divide the load into several streams for increased surface and heat transfer.

KILN SEAL
Adjustable plates or rings installed around feed end or discharge end of rotary kiln for prevention of infiltration of air.

KILN SHELL
The cyclindrical outer mantle of a rotary kiln made of steel plate, ¾ in. to 1½ in. thick. Shipped in

sections and riveted or welded together during erection. Often equipped with stiffener rings to maintain cylindrical shape.

KILN SLOPE
(see KILN INCLINATION)

KILN SPEED
Speed of rotation of rotary kiln stated in revolutions per hour (rph), less frequently in seconds per revolution.

KOMINUTER (trade name)
Ball mill, sometimes equipped with planetary or annular screens, for grinding raw materials and clinker.

L

LAMINAR FLAME
Rotary kiln flame, all parts of which flow essentially parallel and in the same direction. Mixing occurs by molecular diffusion only.

LAMINAR FLOW
In laminar flow, particles of the substance move in parallel layers or laminae sliding over particles in adjacent laminae but not mixing with them.

LAZY FLAME
Kiln flame characterized by slow undulating movements, approximately following the velocity of the flow of surrounding air.

L/D RATIO
"Slenderness." Length of rotary kiln divided by diameter. Varies between 25 (for short kilns), and 40 (for long kilns).

LEPOL KILN (trade name)
Combination of a relatively short rotary kiln and a preheater embodying a traveling grate, conveying a layer of nodulized raw mix towards the kiln, while hot exit gases are drawn through the layer. Provides high fuel economy.

LIME
Calcium oxide—CaO.

LIME RATIO
$\frac{CaO}{SiO_2+R_2O_3}$ Ratio of lime to silica plus alumina and iron. Used as check of chemical composition of raw mix.

LINER PLATES
(see MILL LINER)

LINING
(see KILN LINING)

LIQUID—SOLID—CYCLONE
Relatively small conical separator, operating in closed circuit with wet grinding mill, for separating slurry into coarse and fine fractions by centrifugal action.

LITER WEIGHT TEST
Method of determining the density in grams per 1000 cc of clinker of uniform, screened size. Indicates degree of burning and, by correlation, the free lime.

LOAD
Material being ground in a mill or burned in a kiln.

LOOP CHAIN
Length of chain, suspended at both ends, inside upper fourth of rotary kiln to increase heat transfer from hot gases to load.

LOUVRE DAMPER
Damper, for control of kiln draft, consisting of a set of horizontal rectangular plates which, like a venetian blind, can be adjusted to various angles through a gear mechanism. Installed in the duct between kiln and draft fan.

LOW-ALKALI CEMENT
Cement containing less than 0.6 percent alkalies, calculated as percent Na_2O + 0.658 times percent K_2O. Specified in some cases for use in concrete made with reactive aggregates. Alkalies originate from raw materials and/or fuel.

LOW $CaCO_3$ STONE
Limestone for cement raw materials containing less than 75 percent calcium carbonate.

LOW HEAT OF HYDRATION CEMENT
Cement (Type IV) characterized by low percentages of tricalcium aluminate and tricalcium silicate. When used in concrete it generates heat more slowly than the other four types of cement.

LUMINOSITY
Quality of flame giving off large amounts of light and heat through radiation.

M

MAGNETIC FLOW METER
Line instrument for measuring slurry flow, used to govern regulating valve on discharge of kiln feed slurry pump.

MAGNETITE
Magnetic oxide of iron, Fe_3O_4. An important ore of iron.

MARBLE
Hard crystalline limestone ($CaCO_3$). Rarely used as a cement raw material because of the large amount of power required to crush and grind it.

MARL
Loose or soft calcareous raw material. In some places, broken marine shells mixed with clay; in other places, fine, soft limestone and clay; sometimes very fine, loose almost pure calcium carbonate precipitated by underground rivers when reaching the surface.

MASONRY CEMENT
Cement used in masonry mortar construction.

MASTER GEAR
Annular gear ring around rotary kiln or ball or tube mill to which the rotation is transmitted from a master pinion.

MASTER PINION
Gear wheel on end of driving shaft of motor or speed-reducer, transmitting rotation to a master gear of a kiln or mill.

McCASLIN CONVEYOR (trade name)
Raw material or clinker conveyor consisting of buckets which move both vertically and horizontally, and which can be adjusted for loading and discharging at various points.

MATHEMATICAL MODEL
Arithmetical equation relating the variables of a process in rigid terms. Used in computer simulation of industrial processes.

MELT
The 20-30 percent of the mass of raw material which has become molten during clinkering ("liquid phase"). Consists primarily of the alumina and iron compounds.

MICRONIZER (trade name)
Laboratory mill for reduction of material to micron size by high-speed impact and particle-against-particle grinding, actuated by compressed air.

MICROSCOPIC ANALYSIS
Qualitative and quantitative identification of minerals (including cement compounds) and distribution of phases in polished, etched samples by reflected light.

MILL CHARGE
Grinding media (balls, cylpebs, concavex, slugs or flint pebbles) with which a grinding mill is charged.

MILL LINERS
Heavy cast or manganese steel plates mounted inside grinding mills to (1) protect mill shell against abrasion from load and charge, (2) improve cascading and grinding action, and (3) sometimes classify grinding media.

MILL SCALE
High-iron waste material obtained from rolling mills in steel plants and often used as a component of the raw mix when Type II or Type V cement is manufactured.

MILLER
The operator who controls the grinding operation of one or several mills by regulating feed rate, speed, circulating load, water, additions or additives, etc., so as to obtain maximum production at the desired fineness and viscosity.

MINERALIZER
(see FLUX)

MINERALOGICAL ANALYSIS
Application of DTA, XRD, or microscopy (see these), for identification of cement compounds instead of by gravimetric analysis.

MIXING
After raw material components (such as limestone, shale or clay) have been ground to the desired fineness and blended in the correct proportions, the slurry or dry raw meal goes through a process of mixing to insure complete homogeneity. Equipment used includes tanks or basins with mechanical or air agitation, circulation by pumping, or fluidization of dry meal with compressed air.

MIXING BASIN
(see SLURRY BASIN)

MODERATE HEAT OF HYDRATION AND SULPHATE-RESISTANT CEMENT
Cement (Type II) generating heat more slowly during hydration in concrete than Types I, III and V, although faster than Type IV; also makes concrete more resistant to attack by sulphate-containing water than Types I and III.

MODULUS
One of several ratios used in calculating the chemical composition of the raw mix. For examples, see LIME RATIO, SILICA RATIO and MOLECULAR RATIO.

MOLECULAR RATIO

$$\left(\frac{CaO}{56.08} - \frac{SO_3}{80.06}\right) \div \left(\frac{60.06}{SiO_2} + \frac{101.94}{Al_2O_3} + \frac{159.68}{Fe_2O_3}\right)$$

A ratio of lime, sulphur, silica, alumina, and iron based on the molecular weights.

MOLY-COP (trade name)
Special grinding media for ball and tube mills. Made of an alloy steel containing molybdenum and copper.

MONOLITHIC
A structure cast entirely in solid concrete. (Literal meaning: "made as one rock.")

MSA PARTICLE SIZE ANALYZER (trade name)
Laboratory instrument for measuring size distribution of particles between 40 and 0.1 microns. Settling is produced by gravity (for coarse particles) and centrifugation (for fine particles); results are calculated from ratios of sediment heights observed in capillary tubes.

MUD RING
An annular accumulation of partly dried or stiffened slurry on the lining or shell near the feed end of a wet process kiln.

MULTIPLE GAS DISCHARGE
Bilateral funnels extending from center of kiln through openings in the kiln shell, through which the kiln gases are withdrawn from kiln into hood or dust chamber. This system permits using only a very small opening in the endplate of the kiln for accommodation of the feed pipe, thus preventing back-spill.

MULTISTAGE
Crushing and grinding raw materials or clinker in several successive operations, each step resulting in greater fineness. Examples: Primary followed by secondary crushers; ball-mills (preliminators) followed by tube mills; and 2-, 3-, or 4-compartment mills.

N

NATURAL CEMENT
The product obtained by finely pulverizing calcined argillaceous limestone. The temperature of calcination shall be no higher than is necessary to drive off carbonic acid gas.

NATURAL DRAFT
Draft in kiln created only by temperature and volume changes of exhaust gases and height and inside diameter of the stack.

NATURAL FREQUENCY CONVEYOR
Horizontal or slightly inclined conveyor for dry materials, consisting of a pan or trough suspended from springs, the conveying action being caused by lengthwise reciprocal movements of the trough. The number of these movements per minute (free oscillations) depends on the weight and design of the pan and frame, length, weight and rigidity of the springs, and weight of material.

NATURAL GAS
A combustible gas issuing from the earth's crust through natural openings or bored wells. Consists essentially of methane with small amounts of ethane, propane, butane, hydrogen, oxide of carbon, nitrogen, helium, hydrogen sulphide, etc.

NEAT CEMENT
Mixture of portland cement and water (with no coarse or fine aggregates) used for grouting or for studies of the performance of cement paste.

NEUTRAL REFRACTORY
Refractory which is neither definitely acid nor definitely basic. The most nearly neutral of all common refractory materials is chrome ore.

NEUTRON ACTIVATION
Determination of trace components in a sample by detecting and interpreting beta or gamma radiation induced by irradiating the sample with thermal velocity or high energy neutrons.

NI-HARD (trade name)
Grinding media and mill liners made of special alloy steel containing nickel.

NODULES
(1) Moist, ball-shaped lumps of raw materials containing 10-12 percent water, up to 1 in. in diameter; used as feed to semi-dry-process rotary kilns, shaft kilns, or Lepol grates. (2) Lumps of nearly dried slurry sliding out of chain section and passing down through wet-process rotary kiln. Depending on a number of operational factors and physical characteristics of the raw materials, nodules contain between 5 and 12 percent residual moisture. The physical strength of the nodules has a considerable influence on kiln capacity, heat economy and dust loss.

NODULIZER
Machine for producing nodules for semi-dry-process kilns or Lepol grates. May be (1) an in-

clined rotating drum, approximately 9 ft. diameter and 15 ft. long, or (2) a rotating disc, up to 30 ft. diameter with a rim, inclined about 30 degrees from horizontal. In both cases the dry raw mix is sprayed with water and nodules are formed by "snowball" action.

NOSE CASTINGS
Heat resistant metal segments for holding kiln lining at discharge end.

NOSE RING
(see ASH RING)

NOZZLE VELOCITY
The speed, frequently given in feet per minute, of fuel (gas) or fuel-air-mixture (gas, oil or coal) entering the kiln, measured or calculated at the tip of the burner pipe.

NUCLEAR MAGNETIC RESONANCE
Qualitative and quantitative determination of elements in a sample by observation of the resonance characteristics of atomic nuclei in an applied magnetic field.

NUCLEAR SLURRY DENSITY GAUGE
Electronic instrument, located on mill discharge stream, to control moisture content in slurry by regulating water feed, or in slurry storage basins by regulating "trim" water.

O

OBSERVATION HOLE
Opening in hood at front end of rotary kiln through which the burning, flame, consistency of clinker load, filling, position of calcined raw mix and burning zone can be observed.

OIL WELL CEMENT
Cement used under high pressure and temperature in sealing water and gas pockets during the drilling of oil wells. Sometimes contains special retarders to meet the requirements of use.

ON-LINE
Measuring or analyzing equipment located on process stream, instead of in separate laboratory.

OPEN CIRCUIT
Grinding arrangement whereby material passes through a mill and is ground to the desired fineness in one pass, without classification and regrinding.

ORIFICE
A mouth-like or throat-like constricted opening in a pipe or duct.

ORSAT
Manually operated, portable apparatus for analyzing kiln waste gases in which carbon dioxide, oxygen and carbon monoxide are successively removed from a given volume of gas tested by passing through chemical solutions.

OSCILLATING CONVEYOR
Conveyor in which the pan or trough is suspended by a number of pendulums and is moved backward and forward with a relatively long oscillation. Actuated by mechanical means.

OVERBURDEN
Layer of soil or unusable rock or other earth formation on top of raw materials in quarries. May vary in thickness from a few inches to over 50 feet, necessitating removal (stripping).

OVERBURNED
Cement clinker is considered "overburned" if it has been exposed to too high a temperature. This results in formation of too much "liquid phase" during the clinkering process and too dense and hard-grinding clinker.

OVERLIMED
A raw-mix is "overlimed" if it contains more CaO than required for the chemical combination with silica, alumina and iron oxide. This may result in the presence of uncombined or "free" lime in the clinker and finished cement.

OXIDIZING FLAME
Kiln flame to which more primary and secondary air is supplied than required for complete combustion. At the high temperature in the burning zone, the excess oxygen maintains the iron in the clinker as "ferric" iron, resulting in darker and greenish cement.

P

PACK SET
(see STICKY CEMENT)

PACKER
Workman, operating machine for packing cement in paper bags.

PACKING MACHINE
Several makes of machines for packing cement in paper bags are used. They are semi-automatic; the packer slips the bag on the spout and starts the filling which is shut off at exactly 94 lb. net weight. On some machines the packer then releases the bag, on others it is done automatically. Capacities range from 900 to 2200 bags per hour.

PALLETS
Portable disposable or re-usuable platforms for storage or transport of bagged cement.

PAN FEEDER
(1) Rugged, slow-moving conveyor consisting of over-lapping, heavy, cast steel or manganese steel pans, used for feeding "shovel-sized" lumps of rock, from quarry-cars, evenly to a primary crusher. (2) Short, vibrating, trough-type feeder for dry materials.

PARTITION
Slotted cast steel or alloy steel grate separating two chambers in a compartment mill.

PASTE
(see GEL)

PAT
A small laboratory-prepared neat cement sample, on glass backing, with a flat surface for setting time tests using Gillmore or Vicat needles.

PECK CARRIER (trade name)
(see McCASLIN CONVEYOR)

PELLETS
(see NODULES (1))

PERICLASE
Hard burned crystalline magnesium oxide.

PERIPHERAL DISCHARGE
Design of ball- or tube mill whereby the ground product is discharged through openings in the mill-shell.

PERIPHERAL INSTRUMENTATION
Sensing instruments integrated with, and feeding input information on process to a computer.

PERMEABILITY APPARATUS
(see BLAINE APPARATUS)

pH
Designation of acidity of water or solutions (amount of hydrogen-ions) defined as $pH=\log\frac{1}{C_H}$, where C_H is the concentration of hydrogen irons in grams per liter. One liter of "neutral" water contains $\frac{1}{10{,}000{,}000}$ gr. of free hydrogen-ions, so the pH of neutral water is:

$$\log\frac{1}{\frac{1}{10{,}000{,}000}}=7.$$

PHASE
(1) A single homogeneous state of matter (vapor, liquid, solid, plasma.) (2) Condition of clinker in burning and initial cooling zones, as "solid phase," and "liquid phase" (indicating molten clinker material).

PIT
Hole in the ground where raw materials are excavated; especially "clay pit."

PITOT TUBE
Apparatus for measuring the velocity of flow of air, water, or other fluids.

PIV GEAR
Speed reduction unit with adjustable ratio. Often used on kiln feeders to permit changes in the synchronized feed rate.

PLANETARY COOLER
A cooler consisting of a number of cylinders built around and parallel with the shell at the discharge end of a rotary kiln; the hot clinker leaves the kiln through these cylinders in counterflow with cooling air, which then enters kiln as secondary combustion air. Examples of planetary coolers are "Solo," "Unax," and "Vickers" coolers.

PLASTER (of Paris)
$CaSO_4 \cdot \frac{1}{2}H_2O$. Gypsum from which ¾ of the chemically bound water has been driven off by heating. When wetted it recombines with water and hardens quickly.

PLUME
Dark, as yet unignited, part of a flame, closest to the nozzle of the burner pipe. Its length depends on the temperature and velocity of the primary combustion air and, if coal is the fuel, its fineness and volatile content.

PLUNGER PUMP
Water, oil, or slurry pump consisting of reciprocating plungers.

PNEUMATIC CONVEYOR
Equipment for transport by compressed air of pulverized or granular dry material such as coal, raw-meal, or cement.

POIDOMETER (trade name)
(see WEIGHING FEEDER)

PORTLAND BLAST-FURNACE SLAG CEMENT
An intimately interground mixture of portland cement clinker and granulated blast-furnace slag. The slag constituent shall not be less than 25 percent and shall not exceed 65 percent of the portland blast-furnace slag cement.

PORTLAND CEMENT
The product obtained by pulverizing clinker consisting essentially of hydraulic calcium silicates, to which no additions have been made subsequent to calcination other than water and/or untreated calcium sulphate, except that additions not to exceed 1.0 percent of other materials may be interground with the clinker at the option of the manufacturer, provided such materials in the amounts indicated have been shown to be not harmful by tests carried out or reviewed by committee C-1 on Cement of the A.S.T.M.

PORTLAND POZZOLAN CEMENT
An intimately interground mixture of portland cement clinker and pozzolan, or an intimate and uniform blend of portland cement and fine pozzolan. The pozzolan constituent shall not be less than 15 percent, by weight, and shall not exceed 50 percent, by weight, of the portland-pozzolan cement.

POZZOLAN
A siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value, but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties. Natural pozzolans are commonly of volcanic origin; artificial ones include FLY-ASH and calcined clay or shale.

PREHEATER
Installation for heating raw mix or slurry ahead of their entry into rotary kiln proper, to improve over-all fuel economy. Hot exit gases are passed through preheaters in counterflow.

PRELIMINATOR
Short, large diameter ball mill for first-stage grinding of raw materials or clinker in a multi-stage grinding system.

PREMATURE STIFFENING
(see FALSE SET)

PREVENTIVE MAINTENANCE
System of planned maintenance based on foreknowledge of necessity of repairs and past history of performance, to forestall undue deterioration of equipment, buildings, roads, fences, etc., and prevent breakdown and interruption of production.

PRIMARY AIR
That part of the combustion air in a rotary kiln which is blown in with the fuel.

PRIMARY BLOWER
Centrifugal blower delivering primary air to kiln. In case of direct firing it also draws air through the unit pulverizer.

PRIMARY DRILLING
Drilling of holes in rock formation for explosive charges for primary blasting, commonly done with rotary or churn drills.

PROGRAMMING
(see COMPUTER)

PROPORTIONING FEEDER
Equipment for feeding components of raw materials or clinker and gypsum to mills in predetermined amounts, and automatically maintaining the set proportions.

PUFFING
Uneven combustion in rotary kiln resulting from incorrect balance between amount of fuel, combustion air and kiln draft.

PUG MILL
Trough-shaped vessel equipped with mixer blades spaced along a horizontal shaft, for mixing and conveying moist sticky materials, such as clay or filter cake, or for mixing collected kiln dust with slurry.

PULSATING SCREEN
(cf. VIBRATING SCREEN)

PUMPABILITY
The ease with which a slurry can be pumped. Depends partly upon the viscosity (inversely) of the slurry, which in turn depends on water content, fineness, particle size gradation, and degree of dispersion.

PYRATOR (trade name)
Combined drying and grinding mill for coal, in which heated grinding media enter the mill with the feed.

PYROMETER
Apparatus for measuring high temperatures in the burning zone of rotary kilns or in exhaust gases; includes electrical thermocouples, optical and recording pyrometers.

PYZEL KILN (trade name)
Upright, cylindrical reactor for clinkering fluidized raw-meal.

Q

QUARRY
Place where substantially dry, rock-type raw materials are excavated in the open. Unless underground mining is used, most cement plants have one or more quarries for different components or types of raw materials.

QUARRY BENCH
Level platform or shelf used to avoid operating with excessively high quarry face.

QUARRY FACE
Vertical side of quarry.

QUARRY FLOOR
Bottom level of quarry where power shovels (loading at foot of quarry face) and railroads and trucks are operating.

QUENCHING
Cooling rapidly by air or water.

QUICK SET
Manifestation of rapid setting of cement paste accompanied by the evolution of relatively large amounts of heat.

QUIESCENT
Without agitation, particularly in regard to storage of slurry.

R

RADIATION
A process by which heat and light are transmitted through gases. In rotary kilns a luminous flame (coal or oil) transmits more heat to the load and to the lining by radiation than a non-luminous flame (gas).

RADIATION PYROMETER
("Electric eye") Pyrometer, located just outside front end of kiln, and aimed at on clinker or lining (not flame) in burning zone to record temperature.

RAKE CLASSIFIER
Machine for separating coarse and fine particles in cement raw material slurry, ground with surplus water. The coarse particles gravitate to the bottom and are scraped up an incline by a set of blades, whereas the fine particles remain in suspension and flow over the edge of the classifier.

RAT HOLE
Colloquial for (1) chain system TUNNEL (which see). (2) The center funnel in a discharging tank or silo formed when raw materials or cement hang up around the edge.

RAW DEPARTMENT
General designation of equipment buildings and operations pertaining to preparation of kiln feed. Often subdivided into crushing, raw grinding, and blending departments.

RAW MATERIALS
Naturally occurring rocks or materials, or waste products, suitable for cement manufacture.

RAW MATERIAL STORAGE
Exposed or covered stockpiles, bins or silos for crushed but as yet unground raw materials.

RAW MEAL
Finely ground mixture of raw materials as used for kiln feed in dry-process plants.

RAW MIX
Slurry or raw meal ground to desired fineness and correctly proportioned and homogenized ready for burning.

RAYMOND BOWL MILL
(trade name)
(see BOWL MILL)

RECIPROCATING FEEDER
(see VIBRATING FEEDER)

RECORDER
Instrument which makes a chart or graph (circular or strip) of the performance of equipment, temperature, draft, fuel consumption, exit gas analysis, fuel-air-ratio, etc. These charts provide a record of operation valuable to management as well as to operators by showing recent history.

RECUPERATOR
Equipment which reclaims heat that would otherwise have been lost. Most clinker coolers are also recuperators, returning some of the clinker heat to the kiln.

RED MUD
Waste product from the manufacture of alumina (aluminum oxide); being high in Fe_2O_3 it is often used as a raw material for cement.

RED SPOT
(see HOT SPOT)

REDUCING FLAME
Kiln flame to which insufficient combustion air is supplied. At the high temperature in the kiln this condition may tend to convert iron in the clinker to "ferrous" compounds, giving the cement a light, tannish color.

REFRACTORY
Kiln lining which can withstand high temperature without fusing.

REVOLUTION COUNTER
An instrument for indicating the total number of revolutions of a piece of machinery, such as mill, kiln, etc. May be located at the machine or electrically connected to a counter on a control panel.

RHEOLOGY
The science dealing with flow of materials. Applies to pumping of raw material slurry and placing of concrete.

RIBBON SCREW
Screw conveyor with continuous helical blade.

RIFFLING
Passing a sample of crushed rock, ground materials, clinker or cement through a riffle to obtain a number of smaller, uniform samples. A riffle is a rectangular box without top or bottom, the interior of which is divided by plates into a system of compartments and chutes.

ROD MILL
Cylindrical mill (as a tube mill) in which the grinding media consist of steel rods, extending the full length of the mill. The cascading and grinding action is generally similar to the action of balls in a ball mill. Used extensively for coarse grinding in ore mining industries and occasionally in cement manufacture.

ROLL CRUSHER
Crusher consisting of one or two rolls, sometimes equipped with manganese steel teeth. Pieces of rock are crushed between the rotating rolls or between one roll and a stationary breaker plate.

ROLLER MILL
A vertical mill in which centrally suspended rollers rotate and are forced against a large ring by centrifugal force to pulverize raw materials or clinker.

ROTARY COOLER
Cylindrical, rotating cooler for clinker; inclined 5-10 percent and located under the discharge end of a rotary kiln. It moves the hot clinker to a conveyor and lets cooling air pass through in the opposite direction.

ROTARY DRILL
(see PRIMARY DRILLING)

ROTARY KILN
Cylindrical (8- to 25-ft. diameter) 200 to 760 ft. long, slowly rotating (60 to 90 r.p.h.) kiln, inclined approximately ½ in. per foot toward its discharge end; for burning cement raw mix into clinker. Lined with refactory bricks and often equipped with internal heat-exchangers.

S

SANDS
Tailings, usually from a RAKE or BOWL CLASSIFIER.

SCALPER
A screen for removing a relatively small quantity of considerably oversize particles. Used on feed material for grinding mills.

SCOOP FEEDER
Slurry feeder for rotary kiln, consisting of a casing in which the slurry is maintained at a constant level, and a slow-moving wheel with two hollow scoops discharging through the hollow shaft.

SCREW CONVEYOR
Conveyor for dry material or slurry consisting of a steel or concrete casing enclosing a continuous helical strip projecting from a rotating shaft.

SCREW FEEDER
Short screw conveyor arranged for feeding dry pulverulent material.

SCRUBBER
Type of dust collector in which dust-laden gases are cleaned by passing through fine sprays of water.

SECONDARY AIR
That part of the combustion air in a rotary kiln which is not blown in with the fuel.

SECONDARY COMBUSTION
Burning which takes place in the kiln beyond the actual burning zone. May be caused by too coarsely ground coal or inadequate mixing of fuel and combustion air. Believed to be a cause of clinker rings.

SECONDARY DRILLING
Drilling of holes for explosive charges in pieces of rock which have been blasted loose during primary shooting in quarries, but which are still too large for handling by shovels or for feeding to primary crushers.

SEGMENT
(1) A section of a number of suspension arrangements which combined make a complete circle of the kiln for certain loop chain systems. (2) A lifter or feed-end constriction.

SEGREGATION
Separation of coarse and fine particles. May occur in stockpiles for crushed rock or clinker, or in slurry conveyors and tanks.

SEPARATOR FINES
The finer of two fractions into which raw material or cement has been divided in an air-separator. Normally conveyed to silos or to a mill for still finer grinding.

SEPARATOR TAILINGS
The coarser of the two fractions previously mentioned. Returned to mill for further grinding or conveyed to another mill for fine grinding.

SETTLING BASIN
(see THICKENER)

SETTING TIME
The time required for a neat cement paste to attain a certain degree of rigidity as measured by the Gillmore or Vicat needles.

SHAFT KILN
Vertical cylindrical stationary kiln for burning lime or cement clinker. Pelletized raw mix is fed at the top, and finished clinker withdrawn continuously from the bottom through rotating grates and air-locks. Has smaller capacity but somewhat better fuel economy than rotary kilns.

SHAKER CONVEYOR
(see OSCILLATING CONVEYOR)

SHALE
Rocky clay, high in alumina, silica and iron oxide, but low in lime. Used as argillaceous raw material.

SHOT
Primary or secondary blast of explosives in mine or quarry.

SHROUDED SCREW CONVEYOR
Screw conveyor with a close-fitting casing.

SIEVE
Laboratory equipment for testing fineness of dry powder, consisting of fine copper mesh screen mounted in a brass ring. Fineness is indicated as X percent passing or retained on a No. Y mesh sieve, Y indicating number of meshes per linear inch.

SILEX LINING
Protective lining for tube mills made of a hard siliceous rock. Used when iron-contamination must be avoided, as in the manufacture of white cement.

SILICA
Silicon dioxide—SiO_2.

SILICA RATIO
$\frac{SiO_2}{R_2O_3}$ Ratio of silica to alumina plus iron. A check of chemical composition of raw mix sometimes used in cement plants.

SILICA ROCK
Hard mineral, high in silica (SiO_2), such as quartz and sandstone. Used as a raw material.

SILICATE
Salt of silicic acid. In cement di- and tricalcium silicates are two of the important components.

SILICONIZED GLASS-BAGS
Dust-collector bags of woven cloth of glass fibers, treated with protective layer of silicone. Able to withstand higher temperatures than cloth bags (f.i. cotton) and are used in kiln exhaust dust collectors.

SILO
Cylindrical container for raw meal, clinker or cement. Generally 20-30 ft. diameter and 60-90 ft. high, built of concrete and equipped with extracting and conveying equipment underneath.

SINTER
To cause to become a coherent solid mass by heating without thoroughly melting.

SINTER GRATE
Kiln incorporating a slowly traveling, horizontal grate on which the combustion and clinkering take place. The nodules, made from raw mix, clinker dust, fuel and water, burn on top of a protective layer of under-burned clinker.

SKIPULTER (trade name)
(see OSCILLATING CONVEYOR).

SLACK
Fine coal screenings.

SLAG
By-product from blast furnace iron and steel production. Contains lime, silica, alumina and iron oxide in such proportions that it may be used as an argillaceous raw material for cement.

SLAG CEMENT
Finely divided material consisting essentially of water-quenched, granulated blast-furnace slag and hydrated lime. It shall consist of at least 60 percent water-quenched, blast-furnace slag by weight.

SLIDE DAMPER
Winch-operated, large, rectangular steel and firebrick slide, which may be raised or lowered inside a duct to increase or throttle the natural kiln draft.

SLIDE SHOE BEARING
Special type bearing for steel-tire

(riding ring) for ball mill, consisting of steel shoe on which the tire slides, and mechanism for maintaining protective oil film.

SLUGS
Disc-shaped punchings of steel plates, or cylindrical cuttings of steel rods, used as inexpensive grinding media in tube mills.

SLURRY
Suspension of ground raw materials in water.

SLURRY AGITATOR
Mechanism, incorporating the constant or intermittent use of compressed air, to prevent sedimentation or segregation in SLURRY BASINS or TANKS (cf). In tall cylindrical slurry tanks air is used exclusively; mechanical agitators or combinations (stationary or traveling) are used in cylindrical, oval or rectangular basins.

SLURRY BASIN
Large concrete or steel container for raw material slurry, equipped with SLURRY AGITATORS (cf). BLENDING BASINS receive slurries from different grinding mills; MIXING BASINS are used for homogenization of slurry; CORRECTING BASINS receive slurries of predetermined chemical composition in correct proportions to produce final raw mix; KILN BASINS serve as storage for one or several days' supply of finished slurry.

SLURRY DRYER
Equipment for utilization of hot kiln exit gases for partial or total drying of slurry before it is fed to the kiln. Frequently designed as a drum charged with chains or specially designed heat-exchange elements.

SLURRY FEEDER
Equipment for feeding slurry to kilns or mills at controlled rates. (cf FERRIS WHEEL and SCOOP FEEDER)

SLURRY FILTER
Continuously operating drum or disc-type filter for removing part of the water from slurry by application of vacuum. Special types of filter cloth are used to resist wear and rot. Depending on fineness and plasticity of the slurry, the water content may be reduced 15-20 percentage points.

SLURRY TANKS
Serve same purpose as SLURRY BASINS (cf); BASINS are generally larger in diameter than in height and made of concrete; TANKS are generally smaller and taller and often made of steel plate.

SLURRY THINNERS
A number of organic or inorganic chemicals or waste products which, when added in small amounts to the raw mix at the feed end of wet grinding raw mills, make it possible to produce slurry with less than normal water without loss of fluidity. The use of such slurry results in reduced fuel consumption, more kiln and raw mill production, and larger slurry basin capacity. The most successful slurry thinners are sodium carbonate, sodium silicate, several polyphosphates, ligno-sulphonates (waste sulfite liquor) and certain treated peat, wood, and bark products.

SNAPPY FLAME
Short, brisk kiln flame, of rather high temperature and nozzle-velocity, resulting from a high percentage of primary air, fine grinding or atomization of the fuel, and effective mixing of fuel and air.

SNOWMAN
Formation of sticky clinker following discharge from rotary kiln.

SOAKING
(1) Saturating with water. (2) Prolonged exposure of clinker to heat. Kilns may be designed (or operated) to produce a "soaking heat" (to drive off alkalies). Before the advent of coolers and air-quenchers, the red-hot clinker was sometimes left in a "soaking pit" before being conveyed to storage.

SOLO COOLER (trade name)
(see PLANETARY COOLER)

SORPTOMETER
Instrument for rapid, accurate determination of surface area of solids, based on thermal conductivity recordings of quantities of nitrogen adsorbed on cooled sample and desorbed by warm sample.

SPALLING
Chipping or crumbling of the exposed surface of kiln refractories.

SPECIFIC PRODUCTION
Kiln production per unit of volume or surface.

SPECIFIC SURFACE
The sum of the area of the surface of all the individual particles contained in one gram of a material; given in square centimeters. Sometimes simply called "Surface Area."

SPECTROPHOTOMETER
Instrument for measuring intensity of radiant energy of desired frequencies absorbed by atoms or molecules. Substances are analyzed by converting the absorbed energy to electrical signals, proportional to the intensity of radiation. (See also INFRARED SPECTROSCOPY)

SPIDER
(1) Structural steel rotating framework supporting harrows in washmill or air pipes in slurry agitators. (2) (see YOKE)

SPIRAL
Suspension pattern for chain system in rotary kiln in which the ends of each chain loop are separated a certain distance longitudinally in the kiln and at the same time a certain number of degrees in a circle transverse to the kiln axis.

SPITZER
Oversize particle in ground raw mix.

SPRING GEAR
Master spur gear for rotary kiln fastened to shell by spring plates tangential to kiln and so oriented that they are under tension only.

STABILITY
Regularity of kiln operation. Avoidance of fluctuating loads or cycling.

STACK GAS
Kiln exhaust gas leaving through stack. Often referred to as exit gas.

STAR BIN
(see INTERSTICE)

STICKY CEMENT
(Including Stockhouse Set and Pack Set.) Finished cement which develops low or zero flowability during or after storage in silos, or after transportation in bulk containers, hopper-bottom cars, etc. Believed to be caused by (a) interlocking of particles; (b) mechanical compaction; (c) electrostatic attraction between particles. (cf. WAREHOUSE SET)

STIFFENER RING
Steel ring, commonly of a rectangular cross section, welded to outside of kiln shell to mimimize elliptical deformation.

STOCKHOUSE SET
(see STICKY CEMENT)

STRIPPING
Removal of overburden (cf.) in quarries.

SULPHATE-RESISTANT CEMENT
Portland cement designated Type V, low in tricalcium aluminate, which makes concrete less susceptible to attack by water which contains sulphates.

SUPER-DUTY REFRACTORY
Highly refractory, fire-clay brick for kiln lining. Has low porosity, high resistance to fluxing and thermal spalling, and strength and constancy of volume at high temperatures.

SURFACE AREA (S.A.)
(see SPECIFIC SURFACE)

SURGE BIN
Bin or tank, not used for storage, but inserted in process to absorb and equalize fluctuations in flow of material.

SUSPENSION PREHEATER
A system of cyclones and raiser pipes in which dry process kiln feed is preheated in contact with kiln exit gases.

SWIRL POT
(see VORTEX FEEDER)

SYNCHRONIZATION
(see FEED SYNCHRONIZATION)

SYNCHRONOUS MOTOR
A.C. motor, whose speed is directly proportional to the number of cycles of the current.

T

TABLE FEEDER
(see DISK FEEDER)

TAILINGS
See SEPARATOR TAILINGS)

TEMPERING AIR
Cold air mixed with hot kiln exit gases to reduce their temperature for protection of draft fan.

TETRACALCIUM ALUMINOFERRITE
C_4AF—One of the four potential compounds in portland cement. $4CaO \cdot Al_2O_3 \cdot Fe_2O_3 = Ca_4Al_2Fe_2O_{10}$.

THERMOCOUPLE
A pair of dissimilar metals so joined as to produce a thermo-electric effect when heated. The magnitude of the thermo-electric effect shows the temperature to which the metals have been heated

THERMOPILE
A group of thermocouples acting jointly to produce electric energy, especially when used as a galvanometer to measure temperature.

THICKENER
Large basin for slurry which has been ground with excess water. Suspended particles gravitate to bottom (underflow), whereas surplus water runs over edge.

THIXOTROPY
A change in structure of a material towards greater liquidity brought about by agitation or stirring. The material usually will rebuild itself in time if not prevented from doing so by externally applied forces.

THROUGHPUT
The total tonnage passing through a grinding mill in a CLOSED CIRCUIT (cf.); equal to new mill feed plus separator tailings.

TIRE
Hollow or solid cast steel riding ring for kiln or mill.

TITRATION
Determination of the calcium-carbonate content of raw-materials or raw-mix, dissolved in hydrochloric acid, by measuring the smallest amount of alkali which will neutralize the solution, as indicated by a color change.

TOE
Outer lower edge of loose rock which has been blasted from quarry face.

TRAMP IRON
Stray pieces of iron, pipe, broken tools or grinding media found in the process flow. Removed by electromagnets and screens.

TRICALCIUM ALUMINATE
C_3A—One of the four potential compounds in portland cement. $3CaO \cdot Al_2O_3 = Ca_3Al_2O_6$. Contributes to low setting time.

TRICALCIUM SILICATE
C_3S—One of the four potential compounds in portland cement. $3CaO \cdot SiO_2 = Ca_3SiO_5$. Attains high strength rapidly.

TRUNNION
Pivot or end of shaft or mill, resting in bearing for support of rotating machinery. Grinding mills are often fed and discharged through hollow trunnions.

TUBE MILL
Cylindrical rotating mill, charged with grinding media; the length is several times the diameter.

TUNNEL
The open space in a kiln chain system below the freely suspended chains. Usually about ¼ to ½ of the kiln diameter.

TURBIDIMETER
Apparatus for measuring the specific surface of cement or raw mix by the reduction in intensity of a light beam passing through a suspension of the material in a fluid.

TURBULENT FLAME
A flame in which the directions and velocities of the fuel and gases supporting combustion cause agitation and more complete mixing and rapid combustion.

TURBULENT FLOW
Flow is said to be turbulent when its path lines are irregular curves which continually cross each other and form a complicated network which in the aggregate represents the forward motion of the entire stream.

U

UNAX COOLER (trade name)
(see PLANETARY COOLER)

UNIDAN MILL (trade name)
(see COMPARTMENT MILL)

UNIKOM MILL (trade name)
(see COMPARTMENT MILL)

UNIT PULVERIZER
Coal mill for service to one individual kiln, drying and grinding in one operation and operating as DIRECT FIRING.

V

VALVE BAG
Paper bag for cement, either glued or sewn, made of 4 or 5 plies of Kraft paper and completely closed except for a self-sealing paper valve through which the cement is introduced.

VANDERWERP RECUPERATOR (trade name)
Slotted heat-resistant steel blocks at the discharge end of a kiln through which secondary air is admitted for cooling and quenching the clinker.

VIBRATING CONVEYOR
Conveyor in which the pan or trough is mounted on cantilever spring bars or rocker arms, and is actuated by mechanical means or electromagnetic impulses.

VIBRATING FEEDER
Feeder actuated by an electromagnetic vibrator. The rate of feed is controlled by the amplitude of vibration imparted to the trough.

VIBRATING MILL
Grinding mill for raw materials or clinker, the motion of which con-

sists of high-frequency vibrations with or without simultaneous rotation.

VIBRATING SCREEN
Screen for separation of crushed rock, slurry or dry ground material from preliminators into coarse and fine fractions; vibrating motion produced by an eccentric or electromagnet.

VICAT NEEDLE
A weighted needle for determining initial and final setting times of hydraulic cements.

VICKERS COOLER (trade name)
(see PLANETARY COOLER)

VISCOMETER
Laboratory or continuously operating line instrument for determination of viscosity of slurry or fresh concrete.

VISCOSITY
Resistance to flow. Measure (inversely) of the fluidity of slurry.

VOLATILE MATTER
The hydrocarbons contained in coal which are readily vaporized and burn earliest during the combustion in kilns.

VOLATILIZATION
The process of driving out and vaporizing the alkalies from cement raw materials during the burning process. Effective volatilization depends on temperature, thickness of bedding, size of nodules, and time.

VOLUME—SURFACE
Dimensionless quantity (Vs) incorporating the volume and internal surface of a rotary kiln, used in calculating production.

VORTEX FEEDER
Wet process kiln feeder in which intimate mixing of slurry and returned kiln dust is obtained by a rapid centrifugal motion imparted to the slurry.

W

WAREHOUSE SET
The partial hydration of cement stored for periods of time and exposed to atmospheric moisture.

WASH MILL
Machine for disintegration of clay, chalk or marl in water; consisting of a set of harrows, suspended from a spider, and dragging rapidly through a circular or hexagonal basin. The finished slurry is continuously discharged through grates.

WASTE GAS
(see STACK GAS)

WASTE HEAT BOILER
System of boilers and economizers heated by the hot exit gases from short kilns.

WATER COOLED JACKET
A metal jacket surrounding that portion of a burner pipe which extends inside the kiln hood. Equipped with inlet and exit openings and pipes so that water may circulate through the jacket to cool the burner pipe.

WATERPROOFED CEMENT
Cement interground with a water repellent material such as calcium stearate.

WAYTROL (trade name)
(see WEIGHING FEEDER)

WEIGHING FEEDER
Feeder for dry materials to mills or kilns, the rate of which is automatically controlled, electrically or mechanically, by the weight of feed on a moving belt.

WEIGHTOMETER (trade name)
Automatic weighing and recording device for use with pan, bucket, or belt conveyor.

WET PROCESS
Grinding, blending, mixing and pumping cement raw materials mixed with water. (cf. DRY PROCESS). Wet process is chosen where raw materials are extremely wet and sticky, which would make drying before crushing and grinding difficult.

WETTING AGENT
Chemical added to water to reduce its surface tension. Spray of water containing a wetting agent spreads over larger area and is used in dust control.

WHIRLCONE (trade name)
(see LIQUID-SOLID-CYCLONE)

WHITE CEMENT
Cement, conforming to portland cement specifications, made from low-iron raw materials (such as KAOLIN) and burned with a reducing flame in the kilns.

WHIZZER BLADES
Rotating blades and louvres in an air separator, whose position can be adjusted from outside.

WILFLEY PUMP (trade name)
(see CENTRIFUGAL PUMP)

WORK INDEX
Index, in KWH/ton, of the expected power consumption in grinding a given rock or clinker from theoretically infinite size to a fineness of 100 microns.

X

X-RAY DIFFRACTION ANALYSIS (XRD)
Quantitative analysis by continuous recording of crystalline compounds in cement by X-ray beam, diffracted from a flat surface of powdered sample, and comparing the angles of diffraction with the angles produced by known compounds.

X-RAY FLUORESCENCE ANALYSIS
Determination of elemental composition of a sample by identification and measurement of secondary or characteristic radiations, caused by exposing a sample to high-energy X-rays.

Y

YOKE
Two- or four-fingered yoke-shaped piece of cast steel used in fastening chains to shell or circumferential segments inside rotary kilns.

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